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A CULTURAL RESOURCE SURVEY AT ORWELL RESERVOIR OTTER
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R A STRACHAN ET AL. JUL 86 DACW37-85-M-1841

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A CULTURAL RESOURCE

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SURVEY

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AT ORWELL RESERVOIR, OTTER TAIL COUNTY, MINNESOTA

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
REQUEST NO. DACW37-85-M-1841

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by

DR. RICHARD A. STRACHAN

and KATHLEEN A. ROETZEL

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<p>The purpose of this report is to present the methods and results of an archaeological survey at Orwell Lake, Otter Tail county, Minnesota. The survey was done to determine the presence or absence of any cultural material at specified areas of the reservoir. Also included was the evaluation of a group of burial mounds previously located by Hudak (1981). The Corps of Engineers is considering a program of bank stabilization as one of the alternatives of erosion control. Thus, it would be necessary to determine if such stabilization activities would disturb, alter, or destroy archaeological sites.</p> <p>As a result of the survey, three previously unknown archaeological sites were found and the burial mounds located by Hudak were relocated.</p> <p>From a cultural resource management perspective, the erosion taking place at Orwell Lake is a destructive force that will significantly alter, damage, or totally destroy the archaeological resources found around the lake. Several protective measures are recommended.</p>					
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ST. PAUL DISTRICT, CORPS OF ENGINEERS
REQUEST NO. DACW37-85-M-1841

July, 1986

by

DR. RICHARD A. STRACHAN and KATHLEEN A. ROETZEL

SUBMITTED BY
IMPACT SERVICES, INC.
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MANAGEMENT SUMMARY

The purpose of this report is to present the methods and results of an archaeological survey at Orwell Lake, Otter Tail County, Minnesota. The project was done according to the contract specifications of the St. Paul District Corps of Engineers Request No. DACW37-85-M-1841, dated May 20, 1985.

The survey was done in order to determine the presence or absence of cultural material at specified areas of the reservoir determined by previous studies to be impacted by severe erosion (Reid 1983). Also included in this project was the evaluation of a group of burial mounds (21 OT 82) previously located by Hudak (1981). The U. S. Army Corps of Engineers is considering a program of bank stabilization as one of the alternatives of erosion control. Thus, it was necessary to determine if such stabilization activities would disturb, alter, or destroy archaeological sites (Page 1).

The primary project objective was the identification of discrete cultural resources -- individual sites -- within specified areas. That identification included definition of spatial boundaries, description of artifact types and their cultural/temporal affiliation. The field work for this project included visual inspection of the Erosion Stations (as per the Scope of Work); subsurface shovel testing; and cutbank planing.

As a result of this survey, three previously unknown archaeological sites were found and the burial mounds located by Hudak (1981) were relocated.

At Erosion Station # 6 (21 OT 91) the artifact distribution was limited to the plowed field outside of Corps of Engineers property. Although it is between 15 and 30 meters from the edge of the cutbank it is not in immediate danger of erosional damage. However, based upon the severity of the erosion on the south side of the south side of the reservoir, bank stabilization should be done to protect the site from future erosional damage. At this point, such activities will have no adverse effects on the site (Page 21).

At Erosion Station # 8 (21 OT 92), five artifacts were recovered from the shovel tests and nine from the adjoining cornfield. Although the site appears to be a lithic scatter, every effort should be made to protect this site from erosional damage. Such stabilization efforts may impact a small portion of the site, however, the impact of stabilization efforts could be less damaging than the impact of continued erosional episodes (Page 29).

At Erosion Station # 8 A (21 OT 93), six artifacts were found in the shovel tests and thirty seven artifacts from the cornfield east and south of the erosion station outside of Corps of Engineers property. Although the site appears to be a lithic

scatter, every effort should be made to protect this site from erosional damage. Such stabilization efforts may impact a small portion of the site, however, the impact of stabilization efforts could be less damaging than the impact of continued erosional episodes (Page 32).

The Director of the Mankato State University Museum of Anthropology has given Impact Services Inc. permission to curate all of the artifacts, field notes, and photographs resulting from this survey. Approval for such curation has also been approved by the Corps of Engineers (Page 2).

I. INTRODUCTION

The purpose of this report is to present the methods and results of an archaeological survey at Orwell Lake, Otter Tail County, Minnesota. The project was done according to the contract specifications of the St. Paul District Corps of Engineers Request No. DACW37-85-M-1841, dated May 20, 1985.

The survey was done in order to determine the presence or absence of cultural material at those areas of the reservoir determined by previous studies to be impacted by severe erosion. The U. S. Army Corps of Engineers is considering a program of bank stabilization as one of the alternatives of erosion control. Thus, it was necessary to determine if such stabilization activities would disturb, alter, or destroy archaeological sites. This project serves not only to fulfill the federal mandates pertaining to the protection of cultural resources, but will also be utilized as a planning tool by the Corps of Engineers.

The specifications for this project are based in legislative and regulatory mandates, per the requirements of the National Historic Preservation Act of 1966 (amended), and the Archaeological Resources Protection Act. These mandates, in turn, are based upon a larger concern of the scientific community, that cultural resources, being sources of important anthropological data, not be disturbed or destroyed by public agencies unless efforts are made to identify them and describe their nature.

For the present project, the scope of the investigation, as defined by the specifications of the Scope of Work, focuses on research on the microcosmic (site-specific) level. The primary project objective is the identification of discrete cultural resources -- individual sites -- within circumscribed areas. That identification includes definition of spatial boundaries, description of artifact types and their cultural/temporal affiliation, and an evaluation of the research potential of each site given the current state of knowledge about the prehistory of the project area.

The field investigation, laboratory analysis, and preparation of this report was done by Impact Services Incorporated, Mankato, Minnesota. The Principal Investigator for this project is Dr. Richard A. Strachan who was in over-all charge of the field work as well as the preparation of this report. Kathleen A. Roetzel and Patricia M. Emerson assisted in the capacity of Field Supervisors and the former assisted in the preparation of this report. The field crew consisted of Mr. Chuck Broste, Mr. John Evenson, Ms. Jodi O'Gormann, and Ms. Michelle Loveall. The fieldwork was done on the weekends in early October, 1985 and the subsequent lab analysis and report preparation was completed in October, November and December, 1985. A total of 30 person days were spent in the field, 2

person days were spent cleaning, cataloging, and analyzing the artifacts in the laboratory, and 7 person days were spent preparing this report.

The Director of the Mankato State University Museum of Anthropology has given Impact Services Inc. permission to curate all of the artifacts, field notes, and photographs resulting from this survey. Approval for such curation has also been approved by the Corps of Engineers.

Project Objectives

As described in the above-referenced Scope of Work, the major objectives of this project called for completion of four general tasks:

- 1) compilation of background data about the cultural resources of the project area, based upon existing knowledge of those resources as contained in state records and other existing documentation;
- 2) data collection in the field by means of reconnaissance-level survey of shoreline, cutbank, and uplands in specified locations around Orwell Reservoir.
- 3) relocation and evaluation of a recorded mound group adjacent to the Otter Tail River; and
- 4) production of a technical report describing and interpreting the methods and results of the literature review and field investigations.

Description of the Project Area

Orwell Reservoir is located in Otter Tail County in west central Minnesota. It is 7 miles south of Fergus Falls, Minnesota and approximately 190 miles northwest of St. Paul, Minnesota (See Figure 1).

The dam became operational in 1953 as a result of the Flood Control Acts of 1948 and 1950. The normal pool level is 1070' with a holding capacity of 14,100 acre feet. The total dam area is 1,985 acres in size which includes the federal owned property around the perimeter of the reservoir most of which (1,870 acres) is leased to the Minnesota Department of Natural Resources.

The specific areas to be surveyed under this contract were initially the focus of a shoreline erosion study done by Reid (1983). His project objective was to identify and quantify the various types of erosional processes that have a negative impact on the shoreline at Orwell Reservoir. These specific survey locations (called Erosion Stations by Reid) are located in Figure 2 and on a U.S.G.S. topographic map on Figure 3. The length of each station is listed in Table 1.

Figure 1: Map of Minnesota

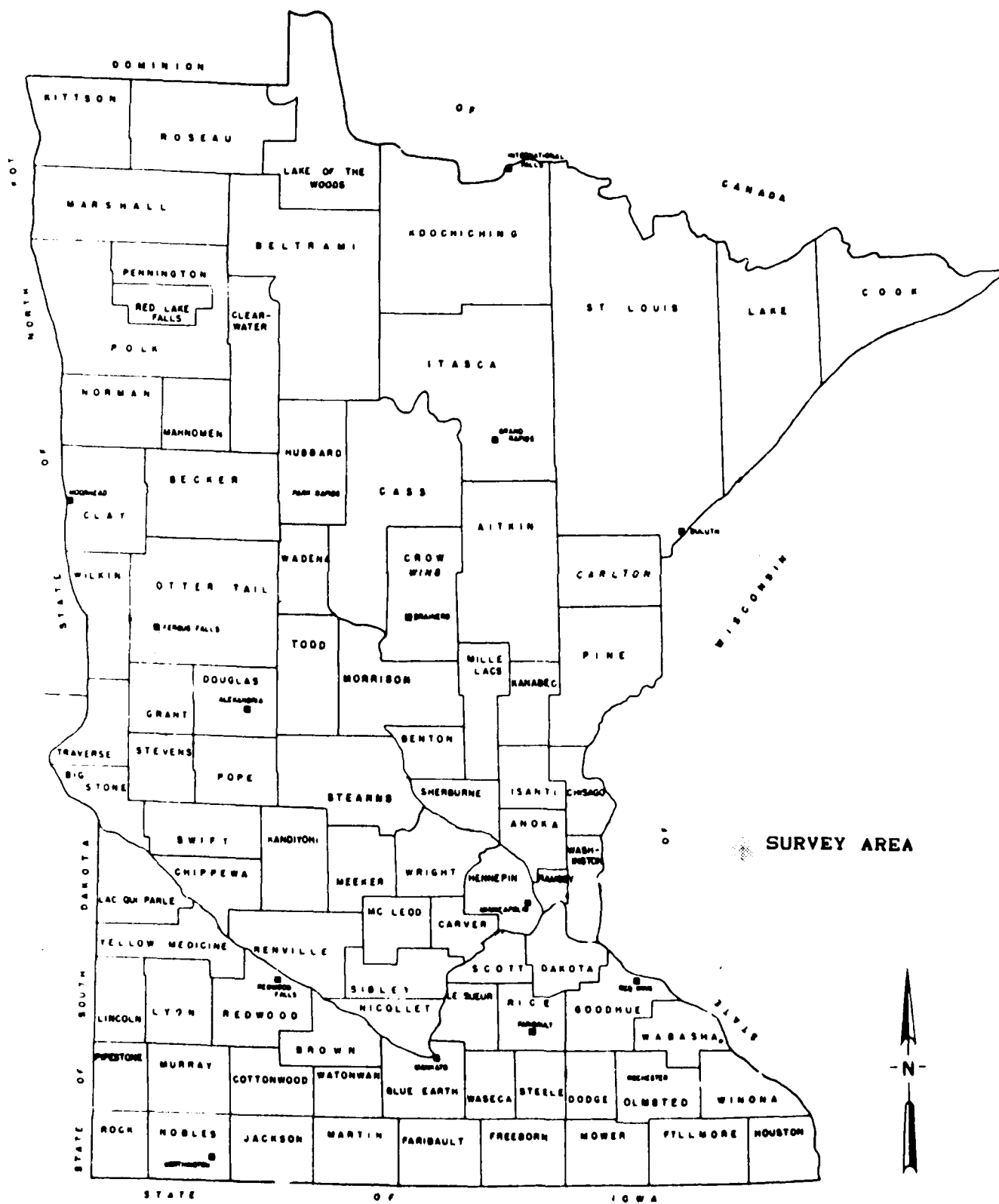


Figure 2: Map of Orwell Lake with Erosion Stations

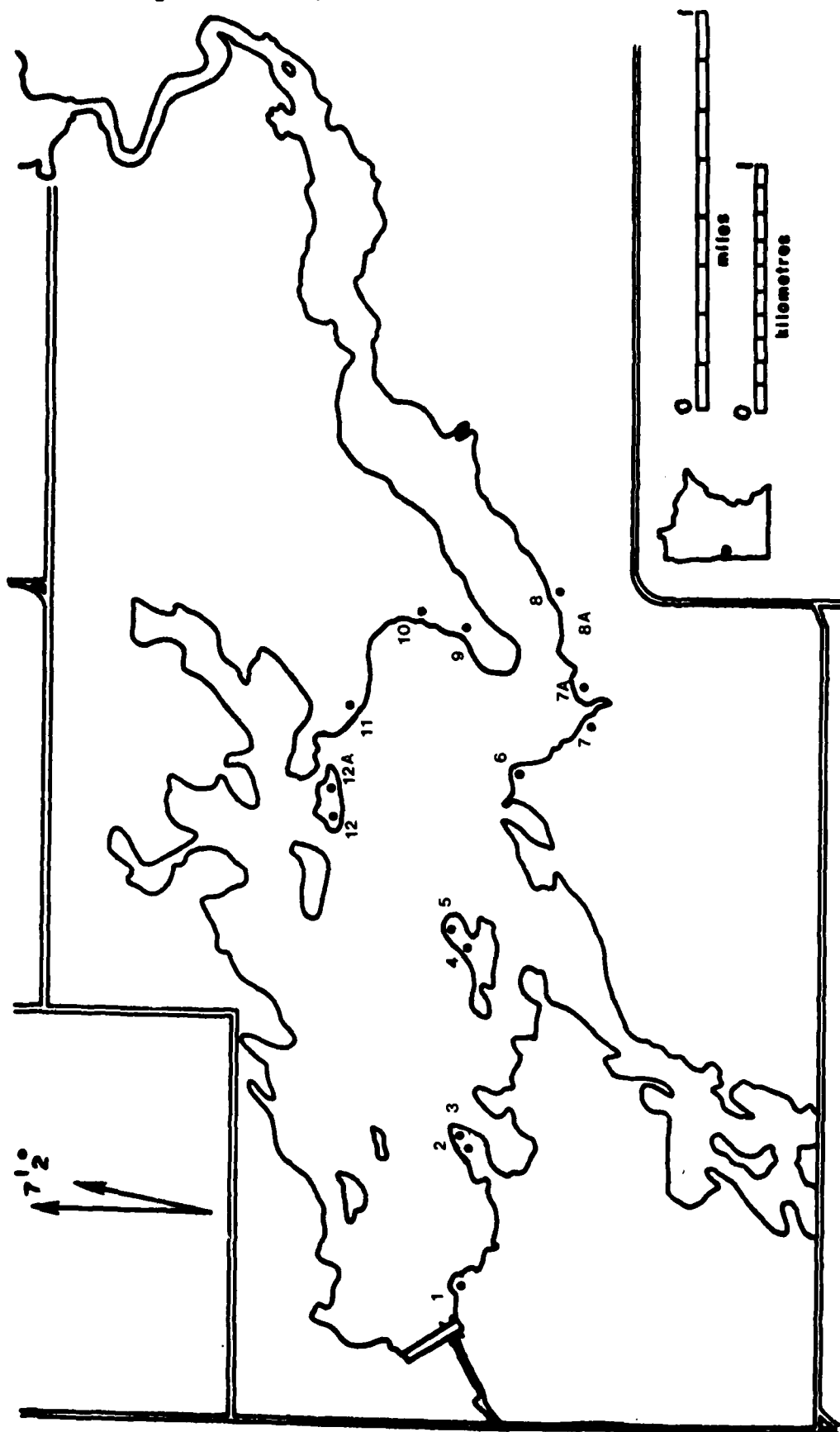


Table 1: Length of Erosion Stations from Scope of Work

Section	Location	Length (m)	Station Bank Height (m)	Average Bank Height (m)
1	ES #1	82.30	3.2	2
2	ES #2, 3	163.06	2.5, 3.4	2
3	E. of #3	70.10	-	1
4	W. of #4	45.72	-	1.5
5	ES #4, 5	247.32	3.5, 3.5	2.9
6	ES #6	156.97	6	3
7	W. of #7	28.96	-	3.5
8	W. of #7	53.34	-	3
9	ES #7	38.10	3.6	1.75
10	W. of #8	97.54	3.2	3.2
11	ES #8	51.82	4	4
12	ES #9	105.00	3.3	5
13	ES #10	79.80	3.4	3
14	ES #11	141.73	3.1	2
15	E. of #12	33.53	-	1.2
16	ES #12	195.07	3.5	2.8

		T=1590.36		

ORWELL LAKE, MINN.

NW 1/4 WENDELL 15' QUADRANGLE
N4607 5-W9607 5/7.5

1973

DAYTON HOLLOW DAM, MINN.

NE 1/4 WENDELL 15' QUADRANGLE
N4607 5-W9600 7/7.5

1973

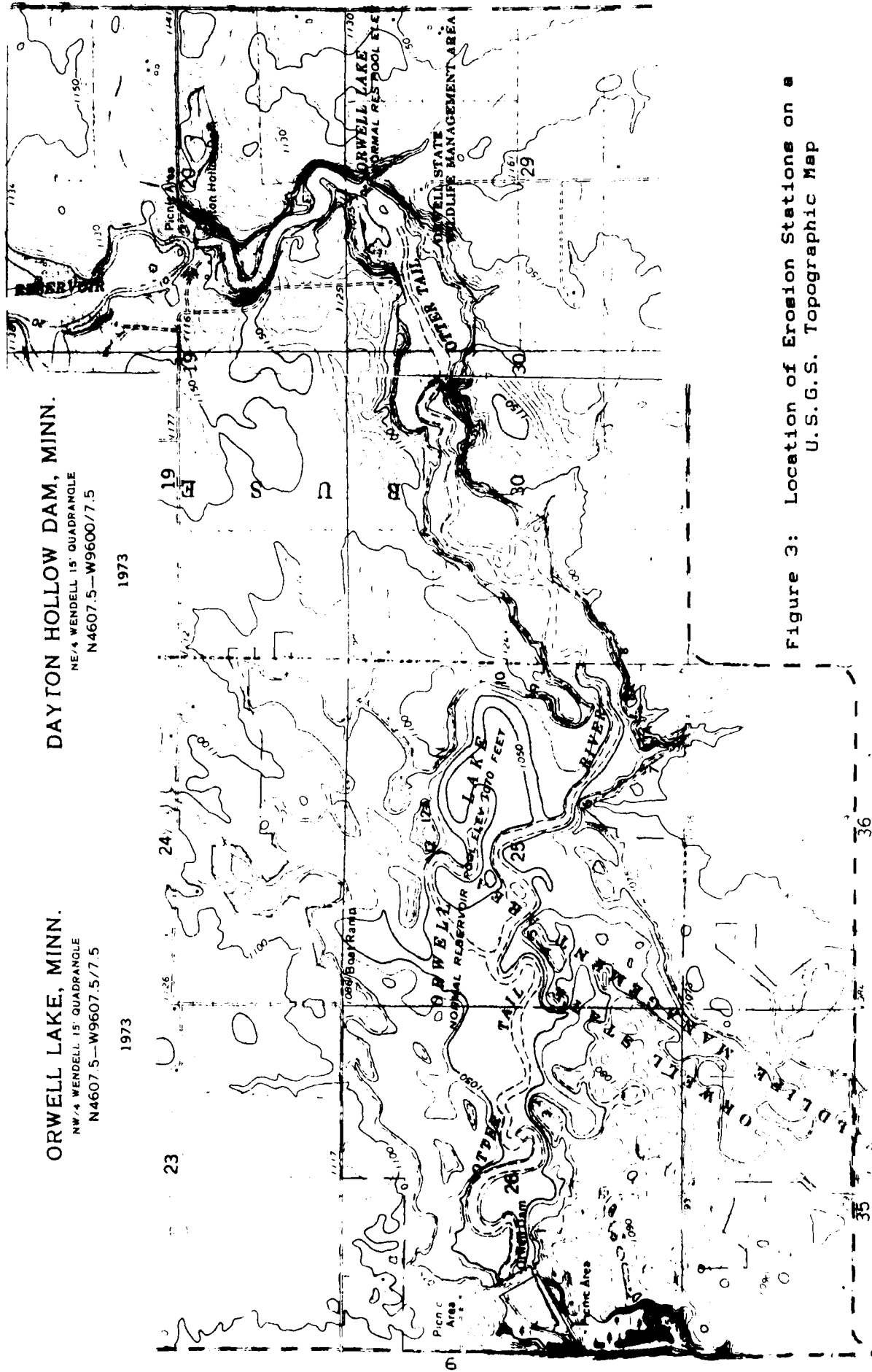


Figure 3: Location of Erosion Stations on a U.S.G.S. Topographic Map

Prehistoric Overview

A summary of the prehistory of the project area and the regions surrounding the project area can only be understood when viewed within the context of the over-all environmental setting. This environmental setting, during earliest cultural occupation, is dominated by glacial Lake Agassiz and through subsequent changes dominated by the geomorphological consequences of Lake Agassiz. This includes beach ridges, flat beach plain, the nearby Red River, and its relatively diminutive tributaries.

Late Paleo-Indian occupations or visitations in the area are documented by Johnson (1962:161-162) in Minnesota and North Dakota and have been tentatively dated at approximately 8,000 B.P. Michlovic (1979a:5) recovered an Agate Basin projectile point in adjacent Clay County, which he suggests would indicate a Paleo-Indian occupation or presence in the general area around 8,000 to 9,000 B.P. The Brown's Valley site is a burial in a gravel pit which yielded brown chalcedony knives as well as fluted projectiles. This site is located approximately 60 miles from the Orwell Reservoir. Saylor (1975) describes what appears to be a Plano Culture occupation in Manitoba on the beach sands of Lake Agassiz. This is significant in that it shows this culture in the general Agassiz basin with its over-all general environmental similarities.

From the evidence, it appears that Paleo-Indian peoples inhabited the area at these very early dates. However, the sparse nature of the evidence tends to lead us to believe that the population density during these early times was quite low.

The period following the Paleo-Indian has generally been called the Archaic. During the Archaic, from approximately 6,000 to 3,000 years ago, archaeological sites become more numerous and it is suggested the the population density in the area begins to expand. The best known Archaic culture is the Old Copper Culture. Artifacts distinctive of this culture are large utilitarian objects, the regional distribution of which includes Minnesota, Wisconsin, and the Upper Michigan peninsula and north into Manitoba and Ontario (Johnson, 1964:8 and Quimby and Spaulding, 1957:189-201). Within the general area, Johnson (1964) reports several Old Copper sites. Also, Michlovic (1979) reports the recovery of three Old Copper Culture artifacts in nearby Clay county. However, since the epi-center of Old Copper Culture tends to be far to the east in Wisconsin, the presence of Old Copper type artifacts does not necessarily mean that we have Old Copper Culture present in western Minnesota, but may mean that Archaic peoples present here were influenced by this strong Archaic cultural manifestation.

Other Archaic cultures existed in the area. Of these, the most common in this area of Minnesota utilized a type of projectile point called Parkdale Eared. Numerous sites have been found in the general Lake Agassiz region containing this cultural manifestation (Shay 1971:47-56, and Michlovic 1979:8-9).

Michlovic (1979:8-9) shows that archaeologists tend to have two interpretations for the cultures utilizing Parkdale Eared projectiles. The first is that these are Early Archaic peoples depended upon now extinct species of bison for their livelihood. The second interpretation maintains that these people were a Later Archaic (more recent) manifestation. Michlovic (ibid), however, presents a well-reasoned argument for these peoples preceding the Old Copper Culture peoples in the area and thereby representing an Early Archaic group.

Post-Archaic peoples in and around the project area tend towards a Plains orientation although some Woodland presence is noted. Michlovic (1979:10) collected more than 12 projectile points, made from North Dakota brown chalcedony, which he identified as early Post-Archaic. It should be noted that this North Dakota material also appears in the artifact inventory collected during this project. The most commonly known Post-Archaic people(s) in the area is the Arvilla Complex. It is a manifestation which occurs around 1300 B.P. and seems to center in the Red River Valley. Johnson excavated the Orvell Site (21 OT 7) in 1964 which is a manifestation of this cultural pattern. Thus, it relates well to this area when he characterizes the Arvilla as follows:

"Simply stated, the complex is characterized by linear and circular burial mounds underlaid by deep pits with complete and disarticulated primary burials, secondary burials and a variety of associated grave goods. Among the latter are numerous articles of shell, bone, antler and teeth. Utilitarian objects of bone and antler are common but chipped stone tools are rare. Pottery vessels as grave goods are uncommon, although pottery elbow pipes are more numerous" (Johnson, 1973:3).

Additionally, pottery has been found in and around the Red River Valley which suggest occupations by, or at least contact with, other Post-Archaic peoples such as Blackduck, Kathio, Malmo and Oneota. The nearby Morrison Mound Group (21 OT 2) is the center of some dispute over its cultural affiliation. Streiff (1972:34) suggests it is Early Woodland based on carbon dates of 690 +/- 200 B.C. while Anfinson (1979:15) based on artifact analysis places it within the Malmo tradition.

The Dead River site (21 OT 51) is located on the east bank of the Dead River near its entrance into Lake Otter Tail. The site yielded Brainerd Ware, 600 - 800 A.D. and Blackduck Ware, 800 - 1400 A.D. (Anfinson 1979:23-50). Thus, some identified Late Middle Woodland and Late Woodland contact or presence is identified in the area.

A summary of the prehistory of the general project area and nearby environs indicated that the prehistoric habitation has been long term and consistent. This appears to be due to the fact that, after the drainage of glacial Lake Agassiz, this area and most of the Agassiz basin maintained a particularly consistent

Plains orientation. The Plains having consistent, but seasonally sparse, resources tended to maintain constant cultural patterns. The region has not undergone the relatively frequent cultural transformations which typify other geographic regions in Minnesota.

Since the general project area is set well within the Plains part of Minnesota it did not see the sometimes dramatic faunal and floral shifts due to relatively minor climatic changes that other regions of Minnesota often incurred. The Big Woods area of Minnesota, as an example changed significantly as a result of quite minor shifts in rainfall and/or temperature. Moreover it is set well to the north of the areas where corn agriculture thrived in Minnesota during the Late Woodland and Mississippian Periods. Thus, the surpluses which seemed to support complex and stratified cultures in later prehistoric times, did not exist in this area.

The Plains areas of Minnesota were far more stable in a social and cultural sense. Cultural traditions and types in this area seem to maintain themselves for extended periods of time. The general project area tends to be typical of northern plains areas. Thus, given the existing body of archaeological data, cultures tend to reflect the more major "temporal" changes while not reflecting less "significant" environmental movements. The overall problem with the general area is that the sparcity of field derived data makes all general conclusions tenuous, at best and certainly subject to the test of time.

II. METHODOLOGY

Literature Search

The first phase of work consisted of a thorough review of available information pertaining to the cultural resources of the project area. This review included a search of the files of the State Archaeologist's Office and the State Historic Preservation Office, in order to compile a list of recorded prehistoric and historic sites within the boundaries of Corps property at Orwell Lake.

The Otter Tail County Historical Society and local informants were contacted for information regarding cultural resources in the survey area. The reports submitted by professional archaeologists who have conducted research in or close to the project areas in the past were obtained in order to compile information about specific locations and descriptions of known resources.

Field Methodology

The utilization of any field methodology or combination of

more than one methodology is dependent upon the specific goals of the survey and the particular characteristics of the survey area. In order to maximize the location of prehistoric sites and to determine the nature and extent of each site, the following methodologies were utilized.

Ground Surface Reconnaissance: This standard technique was used to survey shoreline and cutbanks, and above-bank areas that were sparsely vegetated. All shoreline and cutbanks in the designated survey areas were visually inspected along their entire length. Because the width of the beach never exceeded 100 meters, it was surveyed at a 10 meter interval or often less. The crew of six would walk the beach at each Erosion Station whether it was 10 meters wide or 100 meters. Thus, the interval was variable but the coverage was complete.

None of the Erosion Stations had sufficient ground surface visibility above the cutbank to allow for adequate recovery of cultural materials. Except for scattered rodent burrows, the ground surface visibility was generally less than 10 percent. However, at several of the Erosion Stations the Corps owned property was bordered by fields which were not yet harvested at the time of field investigation. These fields were intensively examined for cultural material with a crew member walking each row. The surface inspection of these fields served not only to aid in the determination of site boundaries where cultural material was found but also to verify negative results.

Cutbank Planing: This technique was used to inspect all of the eroded banks at each Erosion Station. The face of the bank was planed with a trowel or short-handled hoe, and any artifacts, features, or irregularities were noted. There was no specified interval for cutbank planing because the primary determinant was accessibility to the bank. If fallen trees or dense vegetation cover did not allow access to the bank, planing was not done. In areas where cutbank planing was possible, visual examination of the cutbank was done along the entire extent of the Erosion Station and actual planing was done at 15 meter intervals.

Shovel Testing: This survey method was used in all above-bank areas. Shovel test placement was at the discretion of the directing archaeologist. These subsurface tests were a minimum of 30 cm by 30 cm in size, dug in 10 cm artificial levels. All backdirt was processed through 1/4-inch wire mesh screens, and any artifacts recovered were bagged according to pit and level. Tests continued to sterile soil, at which point any necessary measurements were taken and the test holes were backfilled. The depths of shovel tests for this project ranged from 7 cm. to 60 cm.

Auger Testing: Use of the hand-held auger was not necessary at any of the Erosion Stations. The deposits above sterile soil did not exceed 80 cm. which was effectively dug via shovel testing.

Application of Field Methods

The utilization of the various field methods was based upon field conditions and ground surface visibility. Surface reconnaissance was done along the shoreline at each Erosion Station and shovel testing was done above the bank. The difference from one station to another, however, was the proportion of application. Fewer shovel tests were dug at those stations that were bordered by fields. In these areas, the primary methodology was surface reconnaissance supported by shovel tests. In the areas where there was little open ground amenable to surface inspection, shovel testing was the primary methodology supported by visual inspection.

Where artifactual materials were recovered, some additional subsurface examination of the immediate vicinity was done in order to define general site dimensions, both horizontally and vertically. Since the present project objectives specifically exclude site testing to determine NRHP eligibility, the extent of subsurface testing was limited to that necessary to obtain a general picture of the vertical and horizontal configuration of the cultural deposit, its present condition and probable research potential.

Data Analysis

Artifact Catalog: All recovered artifactual materials were cleaned in the laboratory in a manner suitable to each type of material. A unique catalog number was then assigned to each item and catalog sheets were completed. These sheets detail site and catalog numbers, provenience, and artifact description. Where possible, artifacts were identified as to formal type designation and temporal/cultural affiliation.

The few ceramic sherds recovered are described in the catalog as to temper, surface treatment and decorative motifs, where possible. Type designations were assigned, where possible, according to existing type categories as defined in the Handbook of Minnesota Prehistoric Ceramics (Anfinson 1981). Lithic artifacts are described in terms of form, with type designations assigned where possible on the basis of existing type categories.

Rationale for Specific Analytical Methods

The qualitative and quantitative manipulation of the data that was recovered as a result of this project was limited. Because so few artifacts were recovered, even the results of chi-square tests would not have been significant. Thus, the artifacts were simply tabulated on a site-to-site basis and those results are reflected in the next section of the report.

As stated above, all of the artifacts, field notes, photographs, etc. will be accessioned at the Mankato State University Museum of Anthropology. The specimen numbers for the

artifacts recovered from this survey are 49001 M 2 to 49084 M 2. Because the Museum at Mankato State University is computerized, the above numbers would allow access to information pertaining to these specific materials.

RESULTS

This section of the report outlines the results of the literature search as well as the examination of each Erosion Station and the relocation of the burial mound group. It includes a brief physical description of each survey area, the type of field application utilized, and the results of that investigation. This section also includes a map of each Erosion Station with the location of the subsurface test units plotted and the outline of site boundaries where appropriate.

It should be noted here that the interval for cutbank planing was primarily determined by accessibility to the bank. If fallen trees or dense vegetation cover did not allow access to the bank, planing was not done. In areas where cutbank planing was possible, visual examination of the cutbank was done along the entire extent of the Erosion Station and actual planing was done at 15 meter intervals.

Literature Search

There were four known sites at Orwell Lake prior to the start of field investigation. These sites were located by Hudak (1981) during his Phase I field investigation of areas adjacent to the lake. Two of the sites, 21 OT 80 and 21 OT 81 are situated atop the bluff overlooking the lake. These sites yielded flakes, scrapers, body sherds, and bone fragments. Neither of these sites were subject to subsurface testing which was beyond the Scope of Work for that project.

The third site, 21 OT 82, consists of a series of seven burial mounds located on the mudflat along the south shore of the lake. Bison bone, bird bone, unidentifiable bone fragments, snail shells, bits of charcoal, and fire treated granite were recovered from the site. Part of the Scope of Work for this project was to relocate the mounds and evaluate their current condition.

Hudak did not assign a site number to a fourth site, or find spot, because he believed that it was associated with the burial mound site (21 OT 82). This find spot was found during a period of low pool levels. A grooved maul and a possible bison bone were recovered from the site. Currently, the area where these artifacts were recovered is inundated.

The Office of the State Archaeologist was contacted in order to determine the location of other known sites in the immediate project area. There are none on record. However, the Orwell Site (21 OT 7), a Post-Archaic site excavated by Johnson in 1964 is downstream of the project area on the south bank of the Otter Tail River.

The Otter Tail County Historical Society was visited. Ms. Marion Kohlmeier is the Curator, Ms. Pam Brunfelt is the

Archivist, and Mr. Scott Stevens is the Director. There were exhibits of Blackduck pottery from the Dead River excavations, including rims, sherds that were dentate stamped, bossed, and brushed. There were also examples of Brainerd Net-Impressed body sherds. In terms of lithics, they had large celts, axes, blades, bi-face knives, and projectile points on display. Except for the Dead River material, little information was gathered as to the site of origin of many of their specimens. This served only to reinforce the information known of the project area rather than expand it.

EROSION STATION # 1

This erosion station is located east and south of Orwell Dam and north and east of the Corps of Engineers buildings. The beach ranged from 10 to 15 meters wide with little vegetation cover and scattered stands of trees. The shoreline was visually inspected at a 10 meter interval and the cutbank was inspected for evidence of eroding cultural materials.

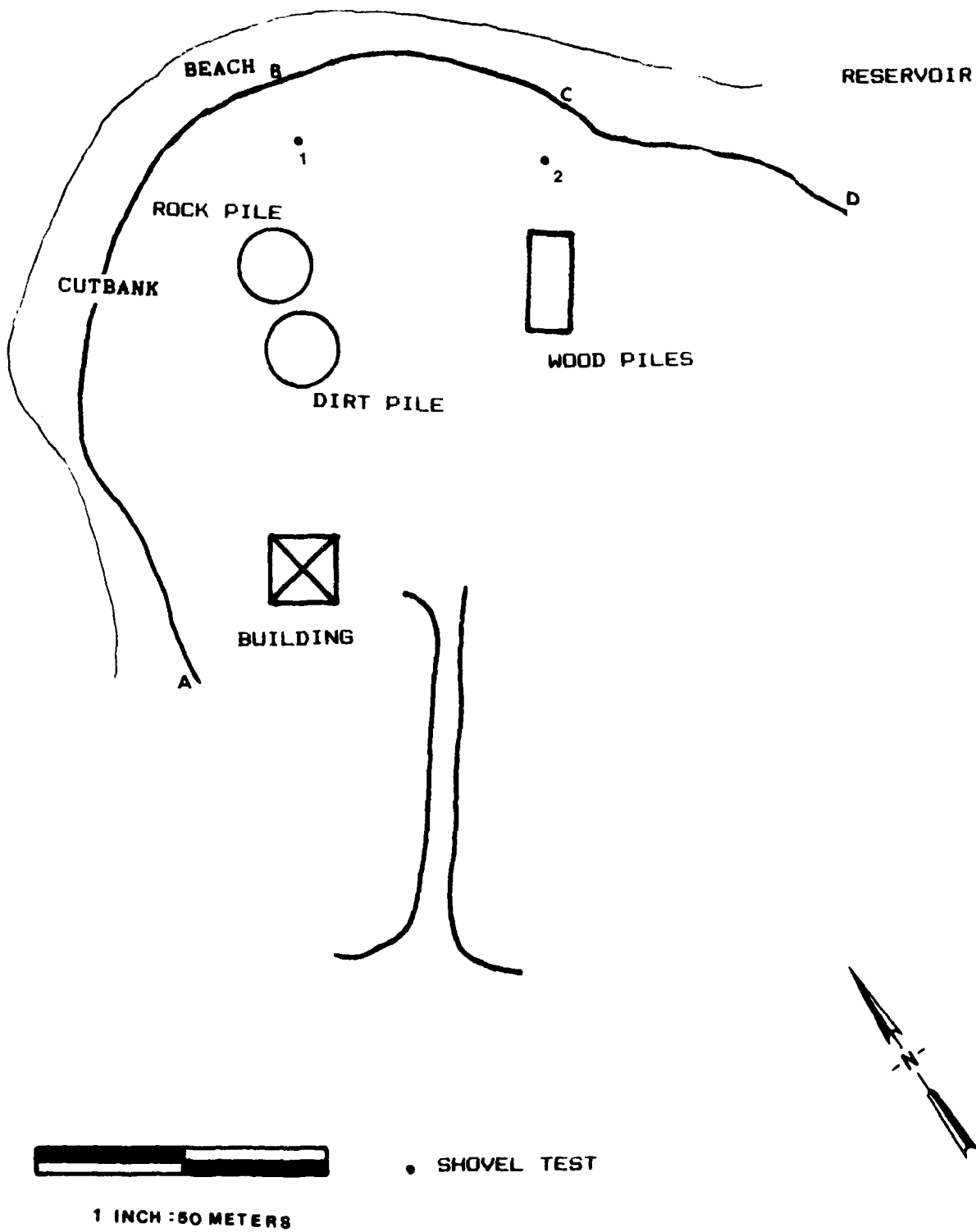
The cutbank ranged from 2 to 5 meters in height with evidence of recent bank failure at the base. This slumpage at the foot of the cutbank was subject to erosion by wave action. However, there was some shoring done with large rocks on a 10 meter strip of the cutbank base. It was evident that bank failure was still occurring, but the fallen bank was being somewhat protected from the destruction of the waves.

Above the cutbank, the area was covered with prairie grass leaving the ground surface visibility less than 10 %. Only the gravel entrance road could be visually inspected. The area was disturbed by the entrance road, two large piles of rocks, a huge dirt pile, and a wood pile. Two shovel tests were dug, one on the east side of the area and one on the west side.

A general summary of the field investigations done at Erosion Station 1 is as follows: 1) 2 shovel tests to sterile sub-strata, 2) 450 meters of cutbank inspection and planning, 3) 100 square meters of surface reconnaissance of the entrance road 1 meter interval and, 4) 2000 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: As can be seen in Figure 4, the area to be surveyed at this location is situated between B and C. However, visual inspection and cutbank planing was done from A to D which is in excess of 400 meters. No cultural material was found either along the shoreline or eroding from the cutbank. However, small bits of charcoal were visible in the cutbank. The distribution of the charcoal was uniform throughout the cutbank both horizontally and vertically. Bits of charcoal were also noted in the cutbank at other erosion stations with the same uniformity. This suggests that they are a result of natural

Figure 4: Map of Erosion Station # 1



prairie fires rather than a remnant of prehistoric habitation.

Shovel Testing: Two pits were dug in areas of the site that appeared to be relatively undisturbed. Shovel Test # 1 is situated 20 meters back from the edge of the cutbank. Shovel Test # 2 is situated 23 meters back from the edge of the cutbank near the woodpiles. No cultural material was recovered from either pit (See Table 2).

TABLE 2: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 1

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 7 cm.		7 - 10 cm.	No
2	0 - 10 cm.		10 - 12 cm.	No

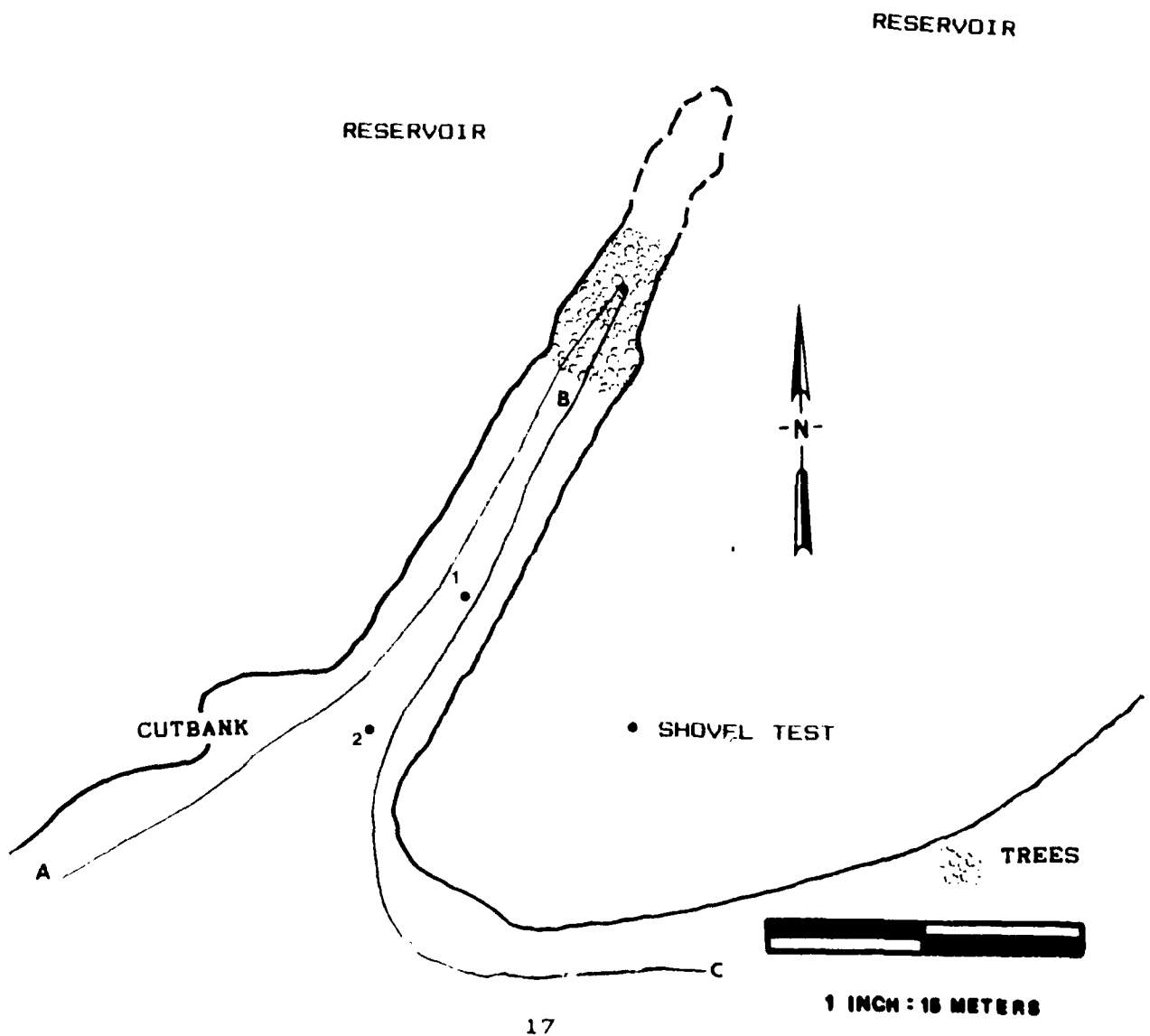
EROSION STATIONS # 2 AND 3

These two stations are located on a point or peninsula on the south shore of the reservoir 1/4 mile east of Erosion Station # 1. In order to access these stations, the crew walked along the beach east from Erosion Station # 1. No cultural material was found. Prior to inundation, the point was almost immediately adjacent to the original channel of the Otter Tail River. There is evidence of severe erosion at this location. The north end of the peninsula has completely eroded to the extent that there is no vertical cutbank along the northern 15 meters of the point -- just a gradual sandy, unvegetated rise from the east side to the west side. Fifteen to thirty meters back from the end of the point the vertical cutbank has not yet completely eroded away due in part to the stand of trees. The beach width is 5 meters. The cutbank along the southeast and southwest sides of the point is less than 2 meters high with variable degrees of erosion evident.

A general summary of the field investigations done at Erosion Station 2 is as follows: 1) 2 shovel tests to sterile sub-strata, 2) 175 meters of cutbank inspection and planning and, 3) 1100 square meters of surface reconnaissance of beach area at a 1 meter interval. The following section provides a more detailed description.

Inspection of Beach and Cutbank: As can be seen in Figure 5, the area to be surveyed at this location is situated between A and B and around the east side of the peninsula to C. Visual inspection and cutbank planing was not possible along either side of the northern 30 meters. No cultural material was found on the beach or in the cutbank as a result of visual inspection or cutbank planing. Again, small bits of charcoal were visible in the cutbank. The distribution of the charcoal was uniform

Figure 5: Map of Erosion Station # 2 and # 3



throughout the cutbank both horizontally and vertically.

Shovel Testing: The only reasonable placements for shovel tests at these stations were in the center of the peninsula where the erosional damage was less severe. Two shovel tests were dug in the prairie grasses between the east and west sides of the point. The difference in depth to clay in Shovel Test # 1 and Shovel Test # 2 is a result of the effects of erosion on the northern end of the peninsula. High water levels and the erosional effects of the waves will continue to remove deposits from this area until the point is completely gone.

Shovel Test # 1 is situated 42 meters south of the waterline in the center of the point. No cultural material was recovered. Shovel Test # 2 is situated 15 meters south of Shovel Test # 1 in the center of the point. Again, no cultural material was recovered (See Table # 3).

TABLE 3: SUMMARY OF SHOVEL TESTS FROM EROSION STATIONS # 2 AND 3

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 15 cm.		16 - 20 cm.	No
2	0 - 10 cm.	11 - 47 cm.	48 - 50 cm.	No

EROSION STATIONS # 4 AND # 5

Erosion Stations # 4 and # 5 are located on one of islands in the reservoir just south of the original channel of the Otter Tail River. The island is roughly "T" in shape with the east and west extensions of the island being very low and marshy. There was significant evidence of massive bank failure and trees eroding off the top of the 4 - 6 meter high cutbank held there in many instances by only a few roots. The overhang along these two stations is up to 1.5 meters with the "A" horizon ranging from 5 cm. to 20 cm. The width of the beach averaged 10 meters with several strandlines evidencing the disturbance by waves. Compared to the north, the southeast side of the island exhibits more vegetation on the beach with scattered trees. The bank height tapers off in this direction to less than 1 meter. The small cove south of Erosion Station # 5 is marshy with very heavy ground cover (See Appendix E, Plate 5).

Above the cutbank, the ground surface visibility was less than 5% with tall prairie grasses and scattered trees. A grid of shovel tests was placed along the northwest side of the island. Because of the topography of the south and east side, no shovel tests were placed in this area.

A general summary of the field investigations done at

Erosion Stations 4 and 5 is as follows: 1) 8 shovel tests to sterile sub-strata, 2) 255 meters of cutbank inspection and planning and, 3) 4) 1900 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: As can be seen in Figure 6, visual inspection and cutbank planing was done between A and B. Although the height of the cutbank was 1 meter and the vegetation was heavy, visual inspection and cutbank planing was done between B and C. No cultural material was found on the shoreline or in the cutbank as a result of planing or visual inspection.

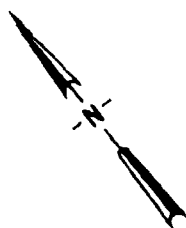
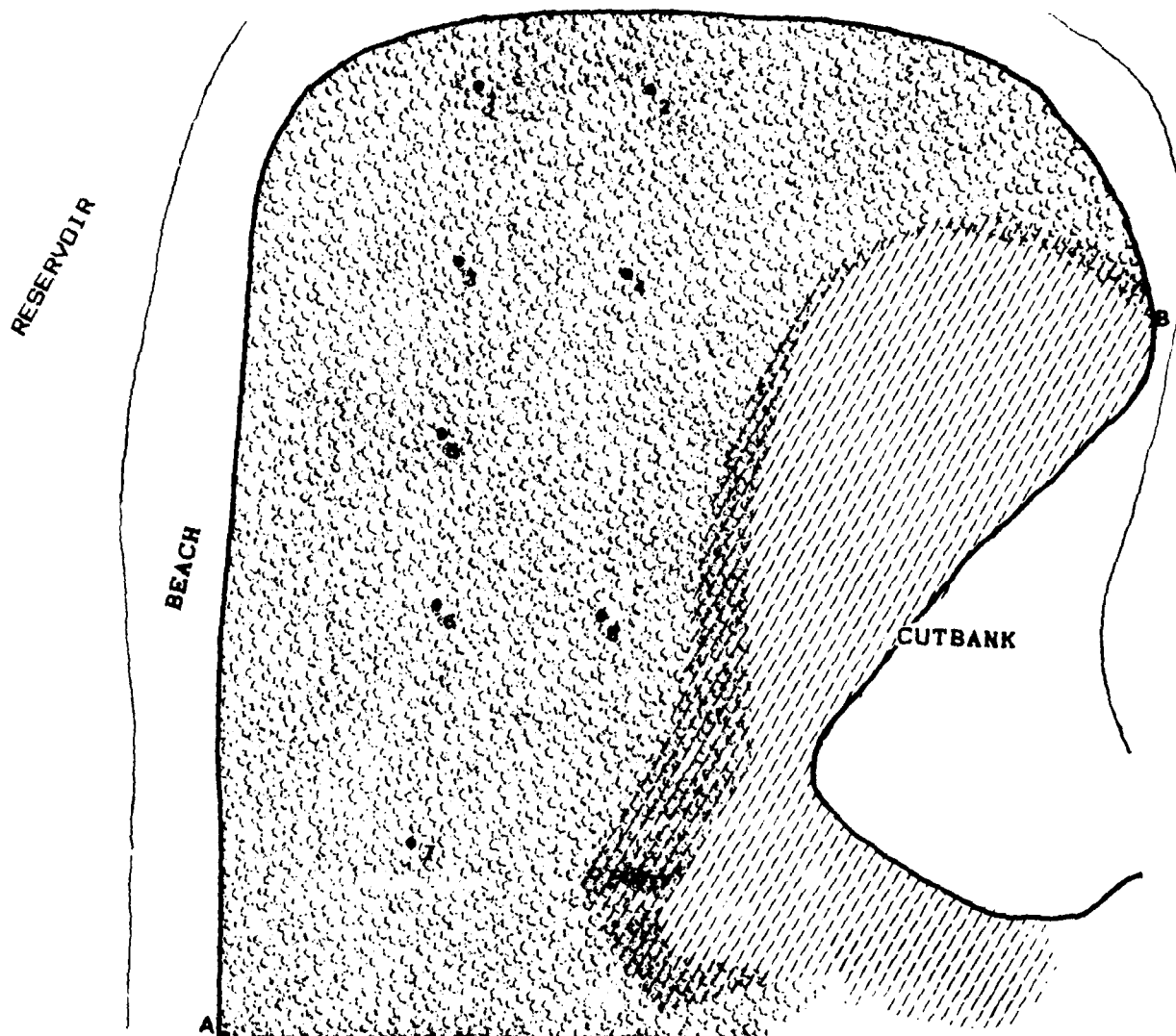
Shovel Testing: Eight shovel tests were dug in the prairie grasses along the northwest side of the island. Shovel Test # 1 is situated 4 meters from the east cutbank and 15 meters from the edge of the north cutbank. No cultural material was recovered. Shovel Test # 2 is situated 6 meters from the east cutbank and 15 meters from the Shovel Test # 1. No cultural material was recovered. Shovel Test # 3 is situated 16 meters from the north cutbank and 15 meters from the Shovel Test # 1. No cultural material was recovered. Shovel Test # 4 is situated 16 meters from Shovel Test # 2 and 15 meters from Shovel Test # 3. and again no cultural material was recovered

Shovel Test # 5 is situated 15 meters from Shovel Test # 3 and 14 meters from the cutbank. No cultural material was recovered. Shovel Test # 6 is situated 15 meters from Shovel Test # 5 and 14 meters from the cutbank. No cultural material was recovered. Shovel Test # 7 is situated 21 meters from Shovel Test # 6 and 14.5 meters from the cutbank. No cultural material was recovered. Shovel Test # 8 is situated 15 meters from Shovel Test # 6. No cultural material was recovered (See Table 4).

TABLE 4: SUMMARY OF SHOVEL TESTS FROM EROSION STATIONS # 4 AND 5

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 15 cm.	16 - 25 cm.	26 - 28 cm.	No
2	0 - 14 cm.	15 - 25 cm.	26 - 30 cm.	No
3	0 - 10 cm.	11 - 20 cm.	21 - 30 cm.	No
4	0 - 20 cm.	21 - 50 cm.	51 - 55 cm.	No
5	0 - 20 cm.	21 - 45 cm.	46 - 50 cm.	No
6	0 - 12 cm.	13 - 20 cm.	21 - 25 cm.	No
7	0 - 15 cm.	16 - 22 cm.	23 - 25 cm.	No
8	0 - 15 cm.	16 - 35 cm.	36 - 40 cm.	No

Figure 6: Map of Erosion Station # 4 and # 5



- SCATTERED WOODS
- SHOVEL TEST
- SLOPED AREA



1 INCH = 15 METERS

EROSION STATION # 6 (21 OT 91)

This erosion station is situated on the south shore of the reservoir adjacent to the former channel of the Otter Tail River. This area showed evidence of the most severe erosion of any that were surveyed under this contract. The bank failure at the base of the cutbank in some cases was as wide as 12 to 15 meters. As a result of this slumpage the beach width ranged from 1 to 7 meters. There were many down trees along the beach but little other vegetation. The overhang on the top of the cutbank in many areas was several meters wide making the top edge of the cutbank fairly unstable (See Appendix E, Plate 1).

Above the cutbank, Corps of Engineers property was covered with prairie grasses which did not allow for surface inspection. The area between B and C on Figure 7 was a very unstable overhang which was not safe enough to walk on much less shovel test. The western one-third of the site was severely sloped to the west. Given the considerable slope of the western portion of the station, shovel testing was not done in the area. A line of shovel tests were dug between the edge of the cutbank and the edge of the unharvested corn field which borders Corps property. The adjacent corn field was intensively checked for evidence of cultural material on the surface.

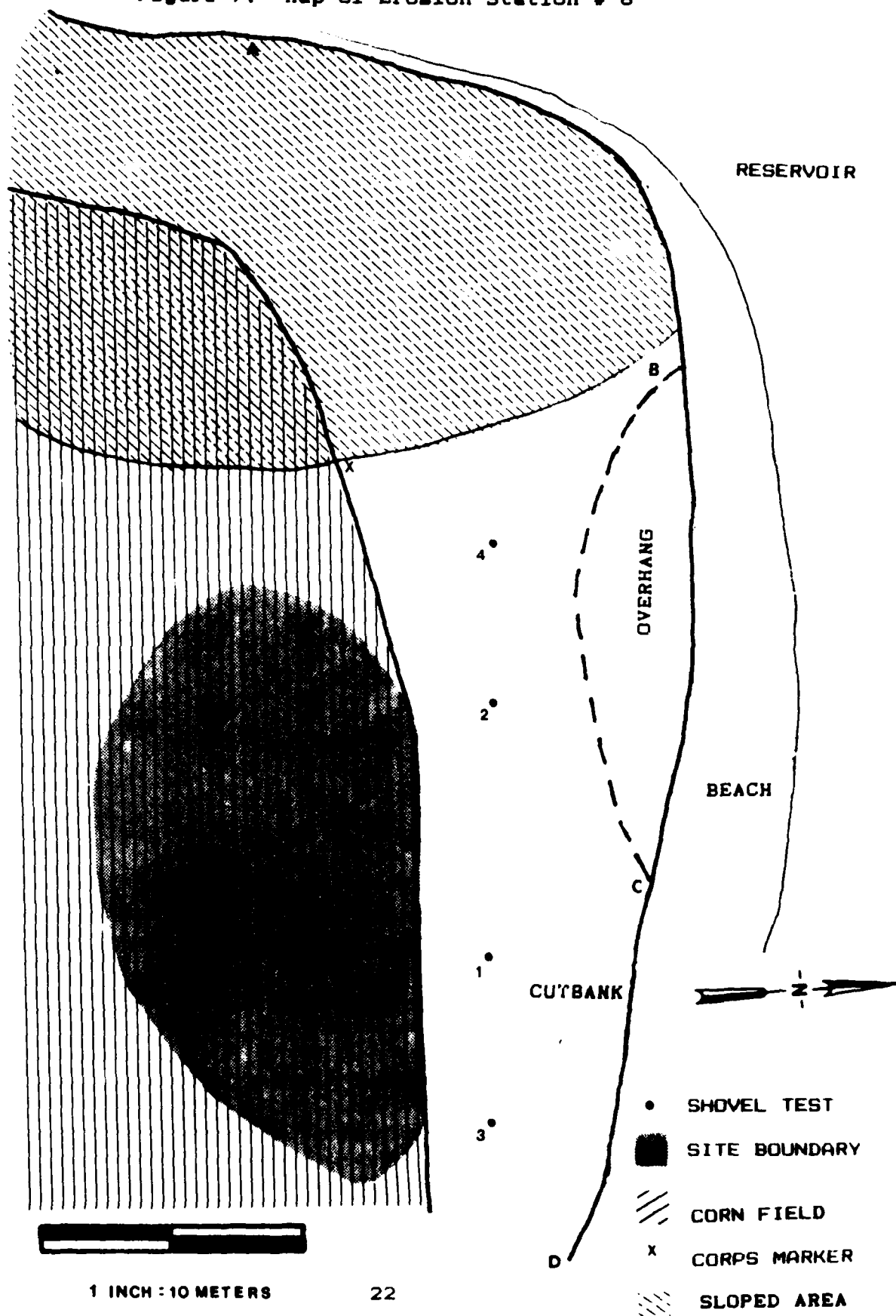
A general summary of the field investigations done at Erosion Station 6 is as follows: 1) 4 shovel tests to sterile sub-strata, 2) 75 Meters of cutbank inspection and planning, 3) 2100 square meters of surface reconnaissance of plowed area at a 1 meter interval and, 4) 1200 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Visual inspection and cutbank planing were done between A and B and between C and D as shown on Figure 7. The entire beach area below the cutbank was surface inspected. No cultural material was found on the shoreline or in the cutbank as a result of planing or visual inspection.

Shovel Testing: Four shovel tests were dug in the prairie grasses between the edge of the cutbank and the cornfield. Shovel Test # 1 is situated 12 meters back from the edge of the cutbank and 7 meters from the edge of the cornfield. No cultural material was recovered from this pit. Shovel Test # 2 is situated 15 meters back from the edge of the cutbank and 7 meters from the edge of the cornfield. Again, no cultural material was recovered.

Shovel Test # 3 is situated 10 meters back from the edge of the cutbank and 6 meters from the edge of the cornfield. No cultural material was recovered. Shovel Test # 4 is situated 16 meters back from the edge of the cutbank and 10 meters from the edge of the cornfield. No cultural material was recovered from this pit (See Table 5).

Figure 7: Map of Erosion Station # 6



No additional shovel tests were placed because the edge of the cutbank was 15 meters west of Shovel Test # 4. We were able to visually inspect the cornfield along the west. This area was sloped down toward the west side of the point. Visual inspection was also done along the east side of the point.

TABLE 5: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 6 (21 OT 91)

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 25 cm.	26 - 38 cm.	39 - 40 cm.	No
2	0 - 14 cm.	15 - 25 cm.	26 - 30 cm.	No
3	0 - 15 cm.	16 - 28 cm.	29 - 32 cm.	No
4	0 - 5 cm.	6 - 13 cm.	14 - 25 cm.	No

Visual Inspection of the Corn Field: There was an unharvested corn field bordering Corps property ranging from 12 to 28 meters from the edge of the cutbank. This field was visually inspected with a crew member walking each row. All of the artifacts from this site were found on the surface of the cornfield primarily toward the east side of the point. The following is an inventory of artifacts recovered.

2 Body sherds (cord-wrapped paddle)	7 Chert flakes
1 Knife River flint blade	1 Chalcedony flake
1 Chert scraper	1 Knife River flint flake
1 Chert utilized flake	2 Flint fragments
1 Knife River flint utilized flake	1 Chert fragment
4 Flint flakes	1 Quartz fragment

No cultural material was recovered from the cornfield on the far west side of the point. The first evidence of cultural material was 4 meters west and south of Shovel Test # 4. The distribution of artifacts recovered from the cornfield was fairly uniform although the frequency of finds was higher toward the east side of the point. The Knife River flint blade was found 10 meters south of Shovel Test # 3. The 2 body sherds were also found on the eastern side of the point.

Site Boundaries: The maximum northern site boundary is determined by the edge of the cutbank. It seems, however, that the site is restricted to the corn field rather than extending to the edge of the cutbank. The western site boundary is determined in part by the steep cutbank on the northwest side of the point and by a complete lack of cultural material on the southwest side of the point. The southern site boundary in the corn field has been determined on the basis of negative results of the surface reconnaissance in the corn rows. A total of 36 rows were checked and the cultural material recovered diminished at about row 20 (The corn row closest to the shovel tests was row

1). No subsurface tests were placed in this area. The eastern boundary is again determined by the topographic features of the point.

Site Type: Based upon the Phase I testing done at this site it is somewhat difficult to determine the kind of site, that is, lithic scatter, short-term camp, seasonal village, etc. The recovery of pottery from the site may suggest some degree of permanence. However, further testing would be required to determine the extent of the occupation.

Site Affiliation: Site affiliation is indeterminant at this time. Not enough (2) diagnostic artifacts were recovered to assign a cultural affiliation or a temporal origin. However, it is certainly possible to assign the general time frame of "Woodland" to the site based upon the two body sherds recovered. These two body sherds are grit tempered with smooth treatment on the inside and cord-wrapped paddle treatment on the outside.

EROSION STATION # 7

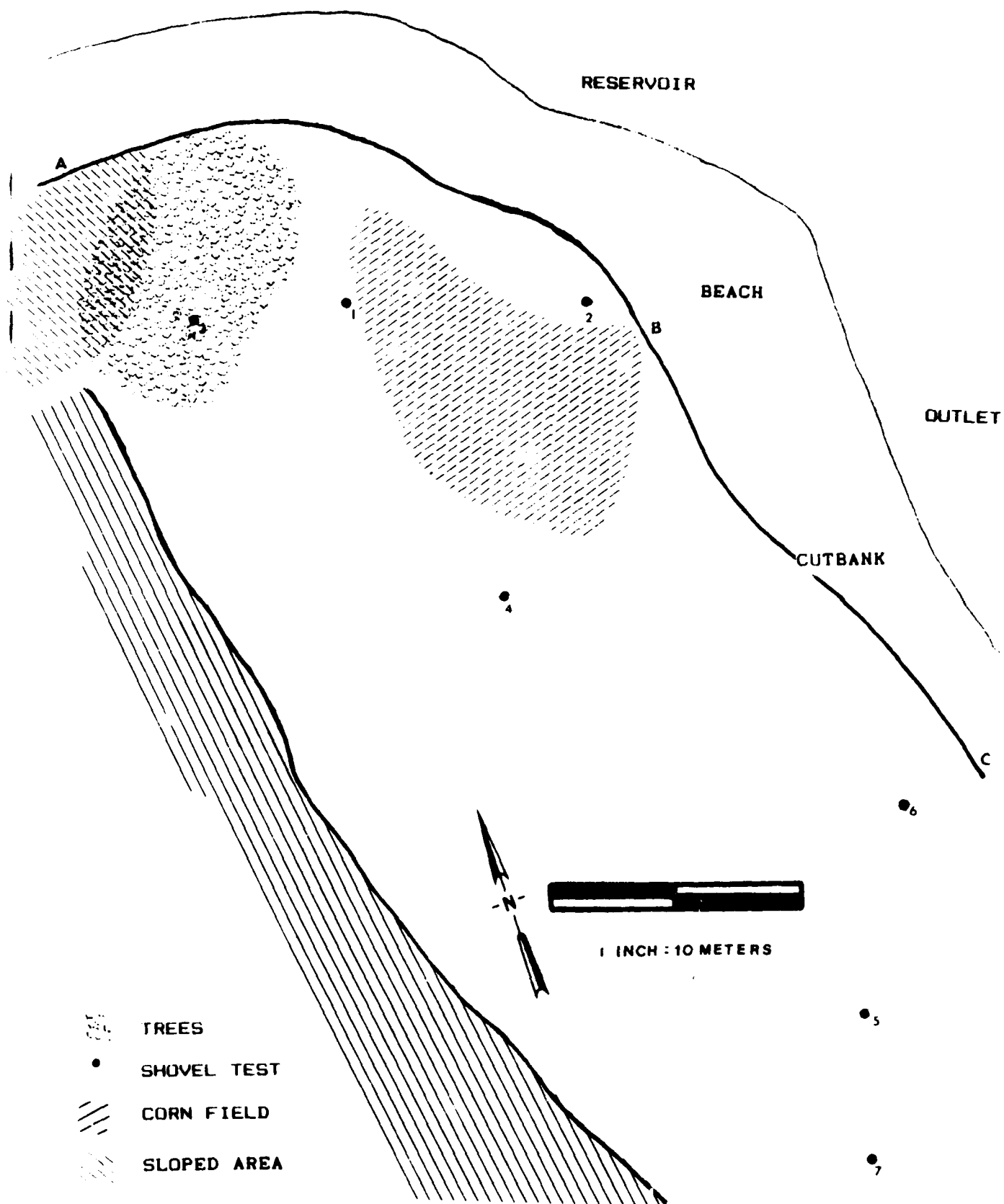
This station is located on the south shore of the reservoir south of Erosion Station # 6 on the west side of the mouth of the outlet. The original channel of the Otter Tail River is less than one-quarter mile to the north. There is running water in the outlet to the east of this station and the main body of the reservoir to the north. The beach at this station is 12 to 15 meters wide with evidence of moderate bank failure and eroding trees. The failure at the base of the cutbank ranges from 1 to 2 meters. The bank failure on the outlet side of the station is far less severe - not being subjected to the erosional forces of heavy lake waves.

Above the cutbank, the erosion station extends from A to B. There were two large depressions as shown on Figure 8. The entire area south to Shovel Test # 7 was covered with heavy prairie grasses and mixed scatters of trees. Because the heavy ground cover did not allow for visual inspection of the surface, four shovel tests were placed within the station boundaries and three were placed outside (# 5, 6, and). An unharvested corn field ran along the south and west side. It was visually inspected for cultural material.

A general summary of the field investigations done at Erosion Station 7 is as follows: 1) 7 shovel tests to sterile sub-strata, 2) 95 meters of cutbank inspection and planning, 3) 800 square meters of surface reconnaissance of plowed area at a 1 meter interval and, 4) 1150 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Although the erosion station extended from only A to B, visual inspection and cutbank planing

Figure 8: Map of Erosion Station # 7



was done from A to C -- well south of the survey limits. No cultural material was found on the beach or eroding from the cutbank as a result of visual inspection. Again, small bits of charcoal were visible in the cutbank with similar uniformity as previous stations.

Shovel Testing: Seven shovel tests were dug at this erosion station. Each shovel tests was dug in tall grasses where the ground surface visibility was less than 10 %. Shovel Test # 1 was placed 15 meters from the edge of the ravine. Shovel Test # 2 is situated 10 meters east of Shovel Test # 1 and 5 meters from the edge of the ravine. No cultural material was recovered. Shovel Test # 3 was placed approximately 22 meters west of Shovel Test # 1 and 10 meters from the edge of the cutbank. In relationship to Shovel Tests # 1 and # 2, this pit is on a rise which runs parallel to the ravine.

Shovel Test # 4 is situated approximately 32 meters south and west of Shovel Test # 3 and 25 meters south of Shovel Test # 1. Again, it was placed along the ridge that followed the ravine. Shovel Test # 5 is approximately 45 meters south and west of Shovel Test # 4. Again, it was placed atop the ridge that paralleled the ravine. Shovel Test # 6 is situated 15 north of Shovel Test # 5. Shovel Test # 7 is situated 12 south of Shovel Test # 5. No cultural material was recovered from any of the shovel tests at this erosion station (See Table 6).

TABLE 6: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 7

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 5 cm.	6 - 10 cm.	11 - 13 cm.	No
2	0 - 10 cm.		11 - 60 cm.	No
3	0 - 15 cm.		16 - 20 cm.	No
4	0 - 12 cm.	13 - 25 cm.	14 - 35 cm.	No
5	0 - 10 cm.	11 - 18 cm.	19 - 22 cm.	No
6	0 - 9 cm.	10 - 27 cm.	28 - 30 cm.	No
7	0 - 8 cm.	9 - 28 cm.	29 - 30 cm.	No

Visual Inspection of the Corn field: There was an unharvested corn field running northwest to southeast along the edge of the outlet. A thorough visual inspection was done with a crew member walking each row. No cultural materials were observed or recovered.

EROSION STATION # 7 A

This Erosion Station is located on the south shore of the

reservoir east of Station # 7 on the east side of the outlet. According to the 1973 U.S.G.S Dayton Hollow Quadrangle map, this station was adjacent to the original channel of the Otter Tail River. There is a small rise on the north end of the survey area which extends from Corps of Engineer property into the adjacent corn field.

The beach at this station was approximately 4 meters wide with sparse vegetation. The vertical cutbank here was unstable due to the massive bank failure leaving an overhang on the top of the cutbank of up to 1.2 meters. The effects of erosion are far more severe along the north end of the survey area facing the reservoir. In this area the vertical cutbank increases from 1.5 meters to 6 meters high.

Above the cutbank, the erosion station extends from A to B (See Figure 9). There is an unstable overhang from B to C. Most of the area is covered with tall prairie grasses with an adjacent corn field to the east of the survey area. There are two clusters of trees, one on the north side and one on the northwest side. Three shovel tests were placed in the tall grasses and the adjacent corn field was thoroughly surface collected.

A general summary of the field investigations done at Erosion Station 7 A is as follows: 1) 3 shovel tests to sterile sub-strata, 2) 135 meters of cutbank inspection and planning, 3) 900 square meters of surface reconnaissance of plowed area at a 1 meter interval and, 4) 950 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Visual inspection and cutbank planing was done at this station from A to B and from C to D. As a result, no cultural material was found on the shoreline or in the cutbank.

Shovel Testing: Because of the adjacent cornfield where the ground surface visibility was 75 %, only three shovel tests were dug at this erosion station.

Shovel Test # 1 is situated 7 meters south and 15 meters east from the edge of the cutbank. It was placed mid way between two clusters of trees to the east and west (See Figure 9). It appears that the depth of the loess is a result of erosion off the ridge to the south.

Shovel Test # 2 is situated 15 meters south and east of Shovel Test # 1 at the top of the rise. Shovel Test # 3 is situated 15 meters north and east of Shovel Test # 2 in the stand of trees. The topographic variation in this general area prompted a thorough search of the ground surface. Small hand rakes were used to remove the fallen leaves from the surface and subsequent visual examination yielded no cultural material. No cultural material was recovered from any of the shovel tests at this erosion station (See Table 7).

Figure 9: Map of Erosion Station # 7 A

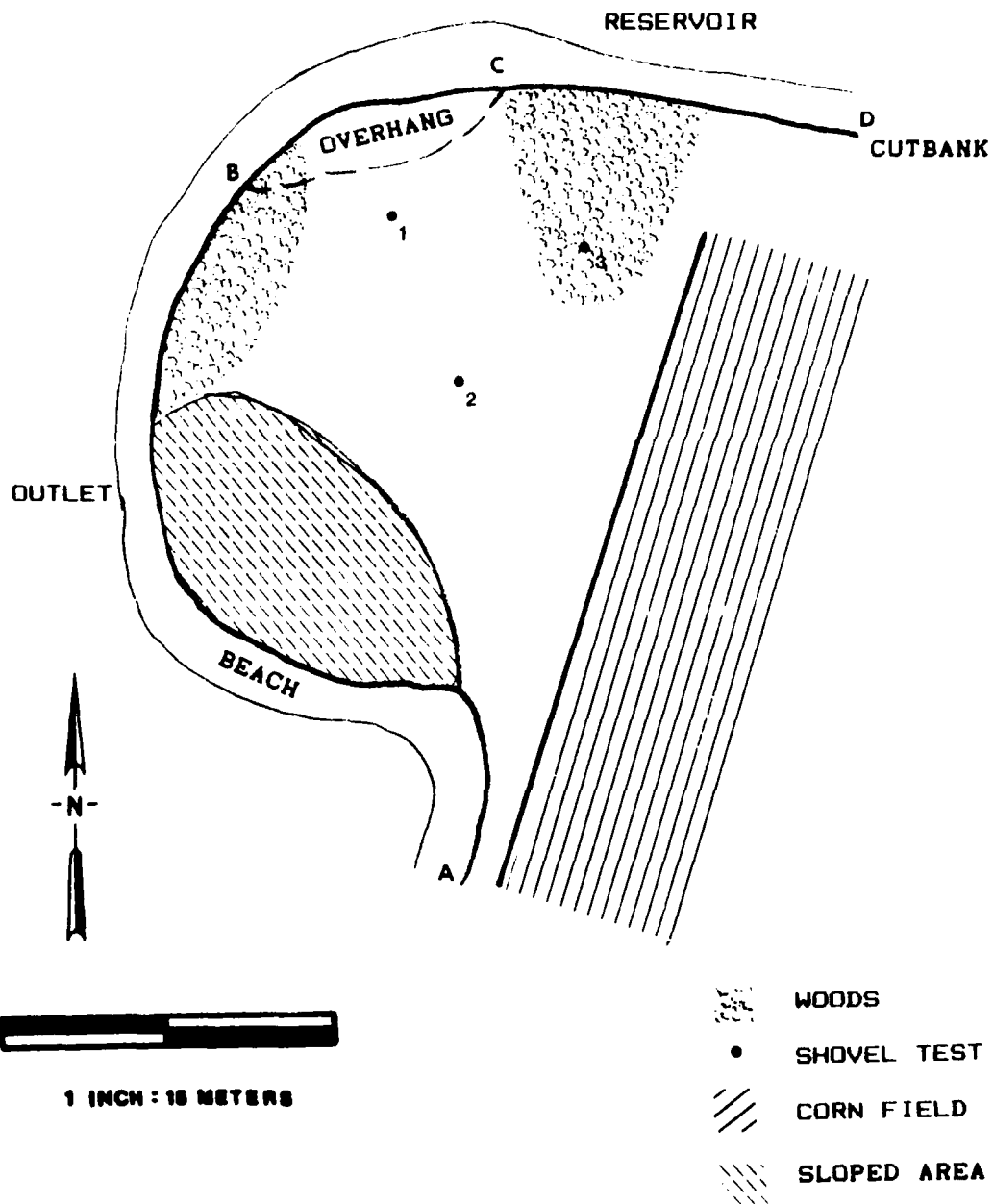


TABLE 7: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 7A

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 45 cm.			No
2	0 - 12 cm.	13 - 22 cm.	23 - 28 cm.	No
3	0 - 23 cm.	24 - 32 cm.	33 - 38 cm.	No

Visual Inspection of the Corn Field: The unharvested corn field along the west side of this station was visually inspected with a crew member walking each row. No cultural material was recovered.

EROSION STATION # 8 (21 OT 92)

This erosion station is located on the south shore of the reservoir just inside the section 30 line. The original Otter River channel is approximately one-quarter mile to the north. There was evidence of bank failure at this station with the slumpage at the base of the cutbank ranging from 1-4 meters wide. The beach supports a relatively high frequency of small trees and grasses which extend from the cutbank to the shoreline. The "A" horizon is 20 cm. deep (See Appendix E, Plate 2).

Above the cutbank, Corps of Engineers property was covered with thick prairie grasses which did not allow for visual inspection. Thus, a pattern of shovel tests were dug between the cutbank and the Corps property boundary marked by the edge of a corn field. The corn field was intensively checked for evidence of cultural material on the surface.

A general summary of the field investigations done at Erosion Station 8 is as follows: 1) 6 shovel tests to sterile sub-strata, 2) 135 meters of cutbank inspection and planning, 3) 10,000 square meters of surface reconnaissance of the adjacent plowed area at a 1 meter interval and, 4) 270 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Visual inspection and cutbank planing was done along the entire bank from A to B. No cultural material was found on the shoreline or in the cutbank.

Shovel Testing: Six shovel tests were dug at this erosion station. Cultural material was recovered from Shovel Tests 2, 3, and 4. All of the shovel tests were dug in tall grasses where the ground surface visibility was less than 10 %.

Shovel Test # 1 pit is situated 15 meters back from the edge

of the cutbank and 7 meters from the edge of the treeline on the west side of the site (See Figure 10). Shovel Test # 2 is situated 6 meters back from the edge of the cutbank and 15 meters east of Shovel Test # 1. A flint flake and a chert flake were found between 10 and 20 cm. No additional cultural material was recovered.

Shovel Test # 3 pit is situated 15 meters south of Shovel Test # 2. There is a single large oak tree 5.2 meters west of this pit. A flint flake and a quartz flake were recovered at 20 cm. No additional cultural material was recovered from this pit. Shovel Test # 4 is situated 15 meters south of Shovel Test # 1 and 15 meters west of Shovel Test # 3. A flint flake was found at 32 cm.

Shovel Test # 5 is situated 15 meters east of Shovel Test # 3 and 13 meters south of Shovel Test # 6. Shovel Test # 6 is situated 15 meters east of Shovel Test # 2, 13 meters north of Shovel Test # 5, and 4 meters from the edge of the cutbank. No cultural material was recovered from this pit (See Table 8).

Visual Inspection of the Corn Field: There was an unharvested corn field south of the site. Shovel Tests 3, 4, and 5 were placed 7 meters north of the field. Because cultural material was found in the shovel tests, a thorough inspection was done in the corn field. The topography of the cornfield slopes off to both the east and west of the shovel test locations. The following is an inventory of the artifacts recovered from the surface reconnaissance of the corn field.

1 Flint projectile (midsection only)	2 Chert flakes
1 Flint utilized flake	1 Quartz flake
1 Chert utilized flake	1 Flint fragment
2 Flint flakes	

Figure 10: Map of Erosion Station # 8

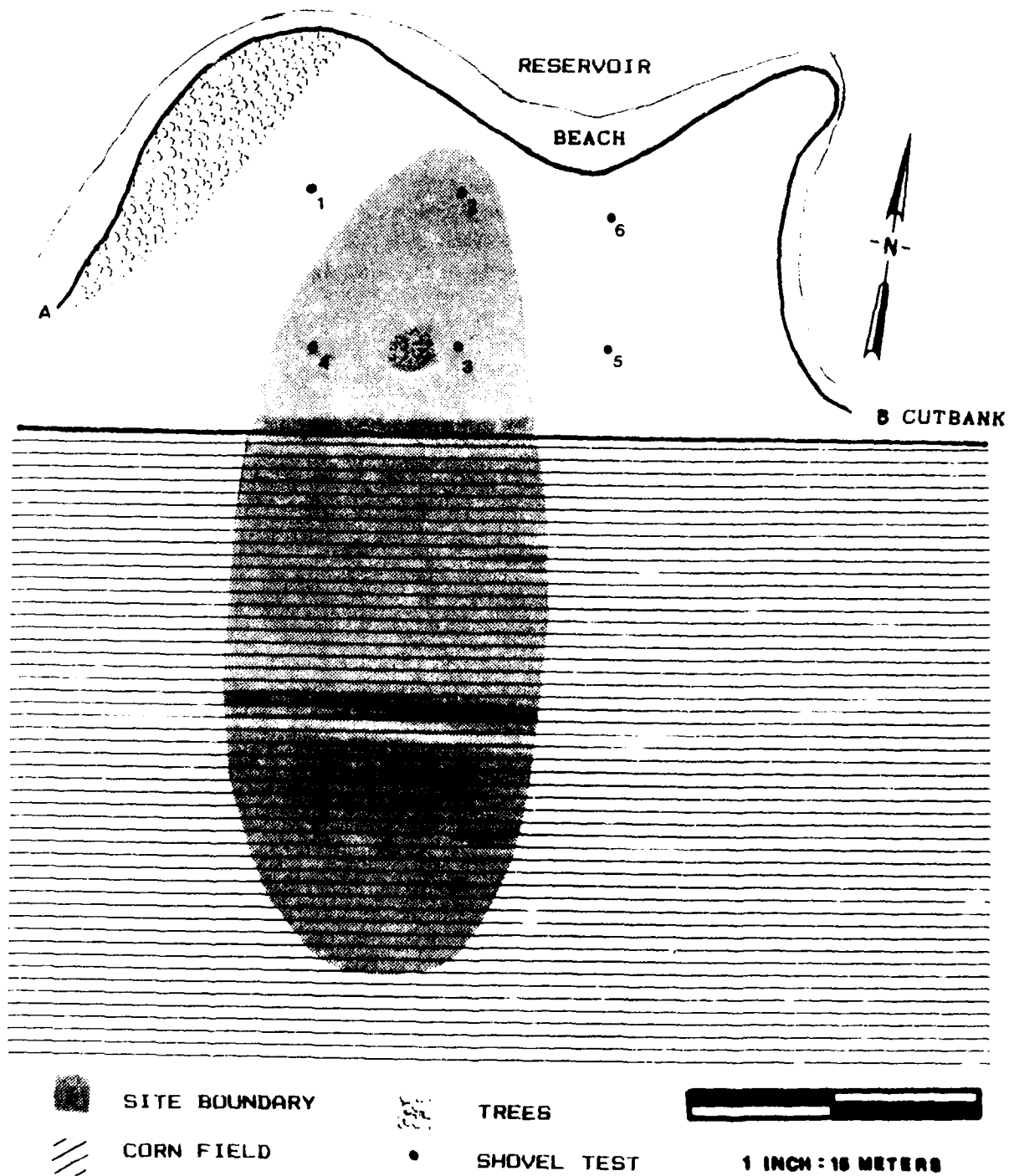


Table 8: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 8 (21 OT 92)

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 25 cm.		26 - 30 cm.	No
2	0 - 20 cm.		21 - 30 cm.	Yes
3	0 - 20 cm.	21 - 30 cm.	31 - 35 cm.	Yes
4	0 - 21 cm.	22 - 34 cm.	35 - 50 cm.	Yes
5	0 - 30 cm.		31 - 35 cm.	No
6	0 - 12 cm.	13 - 15 cm.	16 - 35 cm.	No

Site Boundaries: The northern site boundary is the cutbank. Again, it is impossible to know just how much of this site has been damaged by erosional processes working on the cutbank. The east and west boundaries are the sharp slopes on the east and west side of the site area. Both of these sides of the site were visually inspected from the beach and there was no evidence of cultural material. The distribution and location of artifacts from the surface of the corn field suggest that the site is contained within an elongated oval as can be seen in Figure 10. It must be noted here, however, that surface visibility within the corn field was not 100 %. It is possible that the site area covers the entire ridge but that determination must be made via additional testing. At this point, the distribution of artifacts is restricted to an area approximately 90 meters long by 30 meters wide.

Site Type: Based upon the Phase I testing done at this site it is difficult to make an exact determination of site type, that is, lithic scatter, short-term camp, seasonal village, etc.

Site Affiliation: Site affiliation is indeterminant at this time. The projectile point that was recovered from surface is of little use in making this determination because both the base and the tip are broken. No other diagnostic artifacts were recovered to aid in assigning a cultural affiliation or a temporal origin.

EROSION STATION 8 A (21 OT 93)

This erosion station is on the south shore of the reservoir nearly adjacent to the former channel of the Otter Tail River. It is situated between site # 0.20 (Hudak, 1981) and Erosion Station # 8. Again, there was evidence of severe erosional damage. The beach is approximately 10 meters wide supporting sparse vegetation. There is evidence of bank failure with large trees beginning to fall off the cutbank from above. In lower areas of the cutbank, the topsoil has completely eroded off the

top while in areas where the cutbank is very high the topsoil ranges in depth from 15 to 20 cm. (See Appendix E, Plates J and 8).

Above the cutbank, the erosion station extends from A to B (See Figure 11). There is a rise adjacent to the current reservoir with the topography sloping down to the south, west, and east. The survey area is completely covered with prairie grasses which did not allow for surface inspection. Thus, two transects of shovel tests were dug at a 15 meter interval south of the cutbank and west of an unharvested corn field which borders Corps property. The corn field was intensively checked for evidence of cultural material on the surface.

A general summary of the field investigations done at Erosion Station 8 A is as follows: 1) 6 shovel tests to sterile sub-strata, 2) 120 meters of cutbank inspection and planning, 3) 3700 square meters of surface reconnaissance of the adjacent plowed area at a 1 meter interval and, 4) 1200 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: No cultural material was found on the beach or in the cutbank as a result of surface reconnaissance or cutbank planing.

Shovel Testing: Six shovel tests were dug in the prairie grasses west of the corn field (See Figure 11).

Shovel Test # 1 is situated 15 meters back from the edge of the cutbank and 30 meters west of the cornfield. A chert flake was recovered at 20 cm. and two quartz flakes and a Knife River flake were found at 20-25 cm. At 28 cm. a fragment of unidentified bone was found. The bone was very friable and crumbled easily. In terms of the artifact inventory, these bone fragments have been assigned a single number. No additional cultural material was recovered below 28 cm. Shovel Test # 2 was placed 15 meters west of Shovel Test # 1. A single flint flake was recovered at 20 cm. No additional cultural material was recovered.

Shovel Test # 3 was placed 15 meters south of Shovel Test # 2 and 15 meters from Shovel Test # 1 on the triangular. The field notes indicate the recovery of a fragment of fire cracked rock at 20 cm. but after cleaning and close inspection that was not the case. Shovel Test # 4 is situated 15 meters west of Shovel Test # 2. A flint utilized flake was found between 1-10 cm. No additional cultural material was recovered from this pit.

Shovel Test # 5 was placed 15 meters south of Shovel Pit # 3. No cultural material was recovered. Shovel Test # 6 was dug 15 meters west of Shovel Test # 4. The pit was dug to 32 cm. No cultural material was recovered (See Table 9).

Figure 11: Map of Erosion Station # 8 A

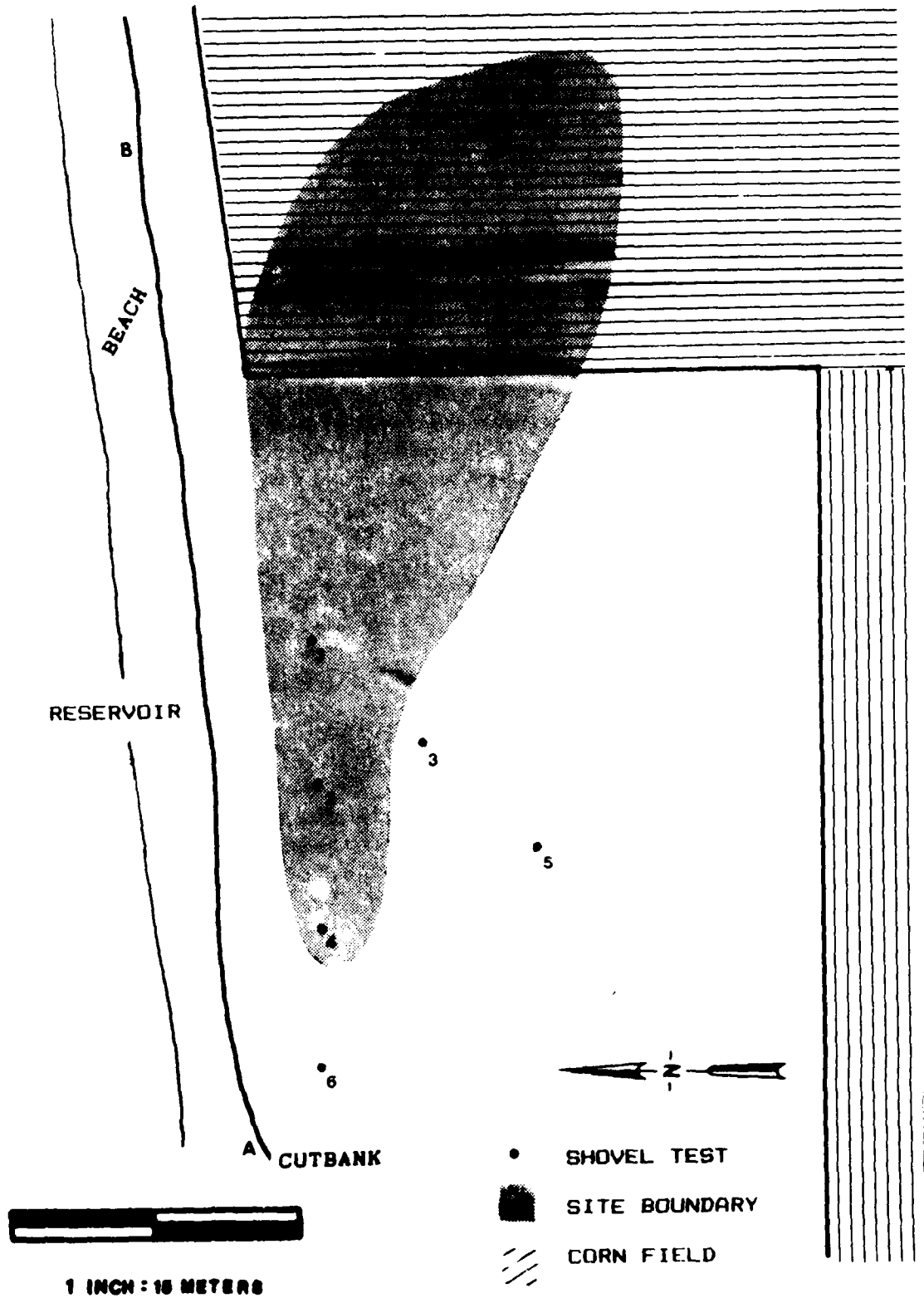


TABLE 9: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 8 A (21 OT 93)

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 20 cm.	21 - 30 cm.	31 - 32 cm.	No
2	0 - 20 cm.		21 - 25 cm.	No
3	0 - 20 cm.	21 - 30 cm.	31 - 35 cm.	No
4	0 - 20 cm.	21 - 30 cm.	31 - 35 cm.	Yes
5	0 - 10 cm.		25 - 27 cm.	No
6	0 - 10 cm.	11 - 27 cm.	28 - 32 cm.	No

Visual Inspection of the Corn Field: There was an unharvested corn field bordering Corps property to the east and south of the site area. The north-south rows were checked and the east-west rows south of the site were also surface surveyed. These fields were visually inspected with a crew member walking each row. The surface collection from this site came from the corn field east of the shovel tests. No cultural material was recovered from the field on the south side of the site. The following is an inventory of artifacts recovered.

1 Body sherd (cord-wrapped paddle)	1 Jasper utilized flake
2 Body sherds (smooth int./ext.)	13 Flint flakes
1 Flint side scraper	10 Chert flakes
1 Flint scraper	2 Flint fragments
1 Chert utilized flake	5 Quartz flakes

Site Boundaries: The northern site boundary is obviously determined by the edge of the cutbank. It is impossible to determine how much of the site has been lost to erosion. The western site boundary is determined by a lack of cultural material in Shovel Test # 6. The southern site boundary was determined on the basis of negative results in Shovel Test # 3 and # 5 as well as negative results of the surface reconnaissance in the corn rows to the south. The eastern site boundary was determined by lack of artifacts in the field.

Site Type: Based upon the Phase I testing done at this site it is somewhat difficult to determine the kind of site, that is, lithic scatter, short-term camp, seasonal village, etc. The recovery of pottery from the site suggests some degree of permanence. However, further testing would be required to determine the extent of the occupation.

Site Affiliation: Site affiliation is indeterminant at this time. Not enough (3) diagnostic artifacts were recovered to assign a cultural affiliation or a temporal origin. However, it is certainly possible to assign the general time frame of "Woodland" to the site based upon the three body sherds recovered. Two of the three body sherds are grit tempered with

smooth treatment on the inside and outside. The other sherd is also grit tempered with smooth treatment on the inside and cord-wrapped paddle treatment on the outside.

EROSION STATION # 9

This erosion station is on the northwest side of a peninsula where the reservoir pool begins to restrict. The beach ranged from 5 meters to 7 meters in width and supported very little vegetation. There was evidence of massive cutbank failure as well as numerous trees beginning to erode.

Above the cutbank, the erosion station extends from A to C on Figure 12. There was a field running generally along the west side of the site. Off of the cutbank from A to B, a large portion of the bank had fallen away in a previous erosional episode. The waves had undercut the slumpage and it was gradually falling. From above, however, it appeared to be relatively intact. Between the cutbank and the edge of the field the survey area is completely covered with prairie grasses which did not allow for surface inspection. Thus, shovel tests were dug between the cutbank and the field and one pit was placed at the top of the slumpage. The adjoining field was intensively checked for evidence of cultural material on the surface.

A general summary of the field investigations done at Erosion Station 9 is as follows: 1) 4 shovel tests to sterile sub-strata, 2) 105 meters of cutbank inspection and planning, 3) 1250 square meters of surface reconnaissance of the adjacent plowed area at a 1 meter interval and, 4) 650 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Cutbank planing and surface reconnaissance of the beach were done from A to C on Figure 12. No cultural material was found.

Shovel Testing: Four shovel tests were dug in the prairie grasses west of the field (See Figure 12).

Shovel Test # 1 is situated on the top of the bank failure discussed above. Shovel Test # 2 is situated on the top of the bank midway between the edge of the cutbank and the plowed field. Shovel Test # 3 is situated 22 meters generally north of Shovel Test # 2. Shovel Test # 4 is situated 15 meters generally south of Shovel Test # 2. No cultural material was recovered from any of the shovel tests at this erosion station (See Table 10).

Figure 12: Map of Erosion Station # 9

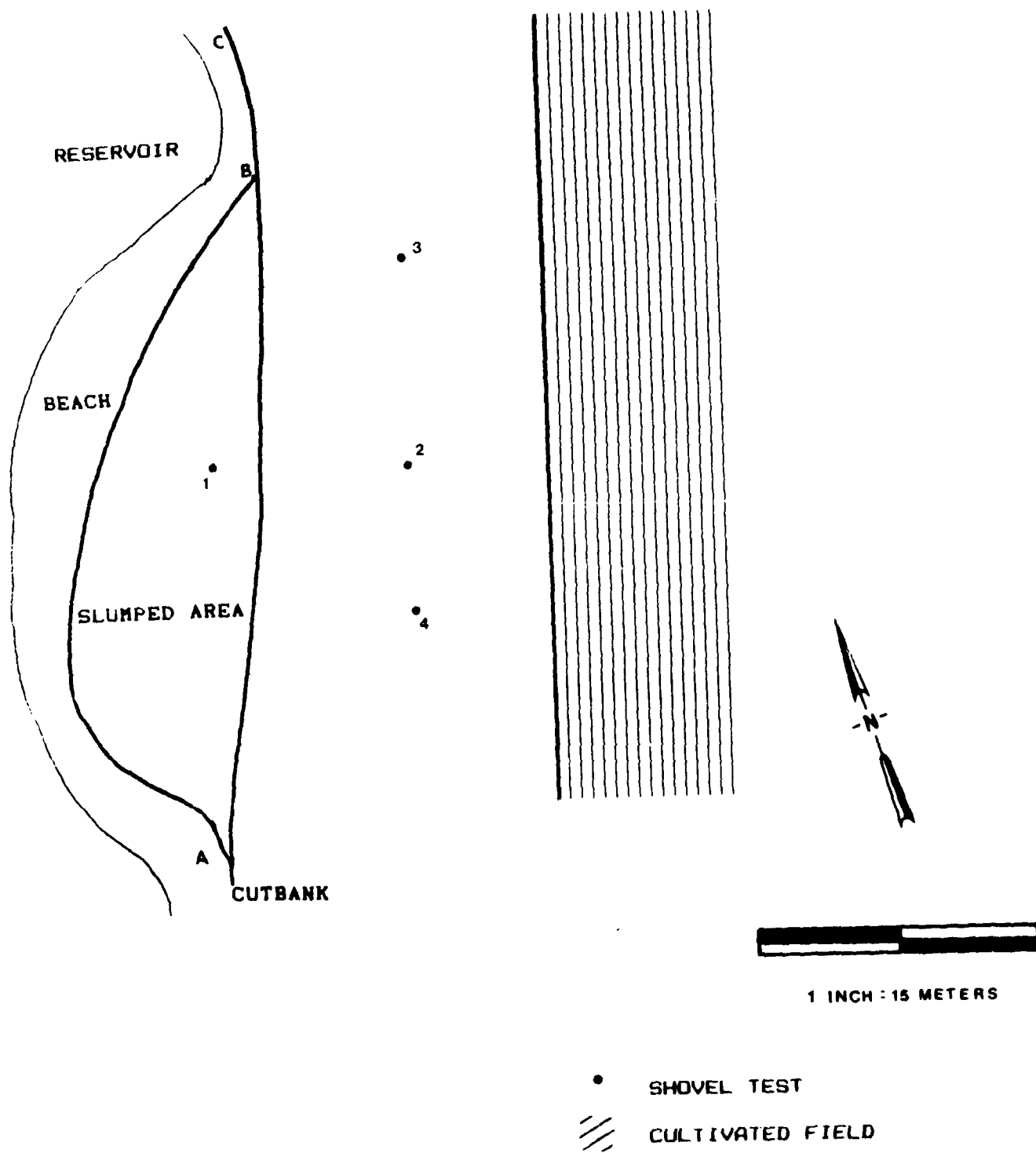


TABLE 10: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 9

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 20 cm.		31 - 35 cm.	No
2	0 - 6 cm.	7 - 12 cm.	13 - 20 cm.	No
3	0 - 12 cm.	13 - 22 cm.	23 - 32 cm.	No
4	0 - 19 cm.		20 - 25 cm.	No

EROSION STATION # 10

This erosion station is on the north shore of the reservoir nearly adjacent to an oxbow of the former Otter Tail River channel. It is situated north of Erosion Station # 9 on a west face. The bank failure and many fallen trees were evidence of the severe erosional damage at this station. The overhang on the top of the bank in some instances was as deep as 3 meters leaving the bank very unstable. The beach was approximately 5 meters wide with the ground surface visibility at 75 %. The visibility of the beach was considerably lower at the north end of this area due to the frequency of fallen trees.

A general summary of the field investigations done at Erosion Station 10 is as follows: 1) 4 shovel tests to sterile sub-strata, 2) 90 meters of cutbank inspection and planning and, 4) 450 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Visual inspection and cutbank planing was done the full length of the erosion station from A to D on Figure 13. No cultural material was found.

Shovel Testing: Four shovel tests were dug in the prairie grasses above the cutbank (See Figure 13).

Shovel Test # 1 was placed 15 meters generally east of the cutbank. Shovel Test # 2 was placed 18 meters north and east of Shovel Test # 1. Shovel Test # 3 was placed 18 meters generally south and east of Shovel Test # 2. Shovel Test # 4 was placed 15 meters east of Shovel Test # 1 (See Table 11).

Figure 13: Map of Erosion Station # 10

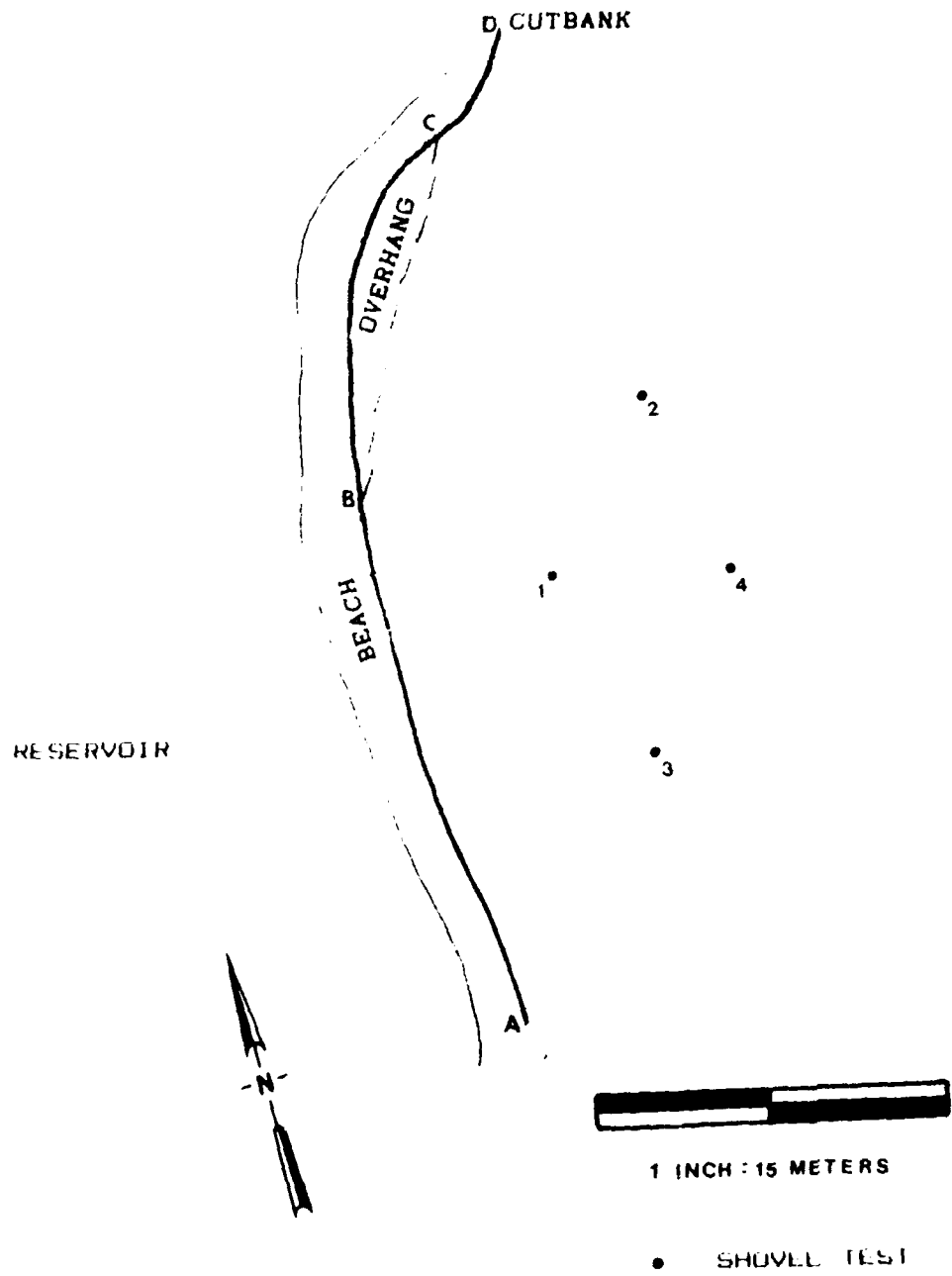


TABLE 11: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 10

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 31 cm.		32 - 35 cm.	No
2	0 - 21 cm.		22 - 28 cm.	No
3	0 - 25 cm.		26 - 32 cm.	No
4	0 - 15 cm.		16 - 25 cm.	No

EROSION STATION # 11

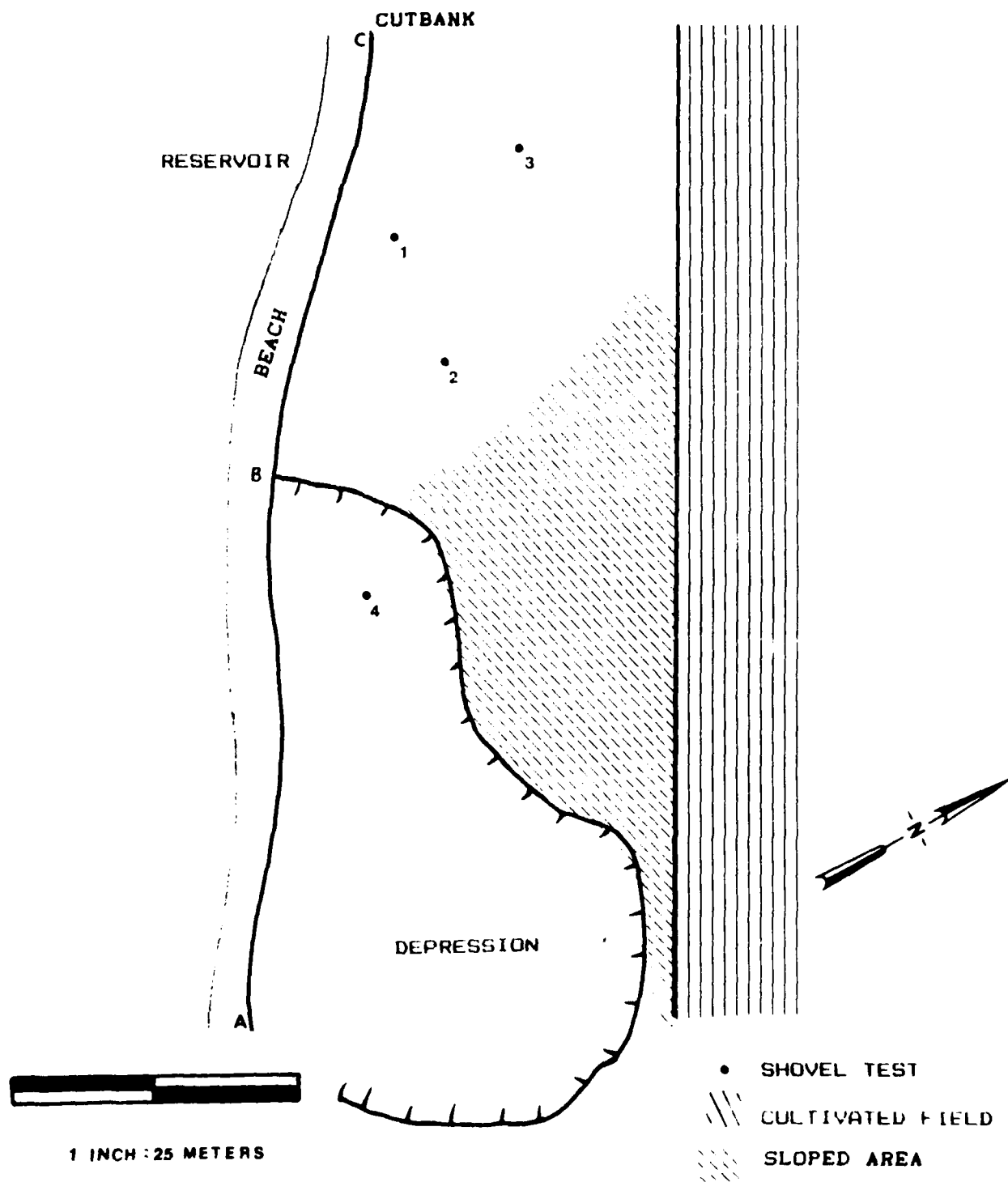
This station is located in the northeasterly side of the reservoir adjacent to Erosion Stations # 12 and 12A on the island. The beach in this area is approximately 10 meters wide with relatively little vegetation. The cutbank ranges in height from one meter on the north end to three meters at the highest. There was little bank failure at the base of the cutbank, but the one meter overhang at the top suggests that previous bank failure had occurred and subsequent wave action had washed it away.

Above the cutbank, the erosion station extends from A to C. There was a sizable depression on the east side of the survey area from A to B (See Figure 14). The area between the depression and the corn field as indicated in Figure 14 slopes off to the east. Given the topography in this area, no subsurface testing was done. It appears as though much of the topsoil from the ridge where Shovel Tests # 1, 2, and 3 were placed has eroded down toward this area. In Shovel Test # 1 and 2 there was no visible topsoil and in Shovel Test # 3 there was only 13 cm. of topsoil. The Corps of Engineers property was heavily covered with prairie grasses which did not allow for surface inspection. Thus, shovel tests were dug between the cutbank and the edge of the field which bordered corps property. This field was also intensively examined for cultural material.

A general summary of the field investigations done at Erosion Station 11 is as follows: 1) 4 shovel tests to sterile sub-strata, 2) 175 meters of cutbank inspection and planing, 3) 4000 square meters of surface reconnaissance of the adjacent plowed area at a 1 meter interval and, 4) 1350 square meters of surface reconnaissance of beach area at a 1 meter interval. The following provides a more detailed description.

Inspection of Beach and Cutbank: Planing and visual inspection of the cutbank were done from A to C on Figure 14. The beach was visually inspected and a single chert fragment was located. There was no evidence of working on the item so it was discarded. No other cultural material was found. The cutbank planing yielded evidence of charcoal bits similar to Erosion Station # 1. The frequency, however, was significantly lower.

Figure 14: Map of Erosion Station # 11



Shovel Testing: Four shovel tests were dug in the prairie grasses between the cutbank and the field (See Figure 14).

Shovel Test # 1 is situated 13 meters back from the edge of the cutbank and 50 meters from the edge of the field. Shovel Test # 2 is situated 30 meters back from the edge of the cutbank and 25 meters from Shovel Test # 1.

Shovel Test # 3 is situated midway between the edge of the cutbank and the field. It is approximately 25 meters from Shovel Test # 1. Shovel Test # 4 is situated 17 meters back from the edge of the cutbank in the west side of the depression. It is considerably lower topographically than the other pits. The depth of clay is perhaps a result of slope wash. No cultural material was recovered from any pits at this erosion station (See Table 12).

TABLE 12: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 11

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 40 cm.			No
2	0 - 50 cm.			No
3	0 - 13 cm.		14 - 30 cm.	No
4	0 - 60 cm.			No

Visual Inspection of the Plowed Field: This field was intensively inspected for cultural material at a five meter interval. This was done on two occasions in order to verify the negative results of the shovel testing. No cultural material was found.

EROSION STATIONS # 12 AND # 12 A

These two erosion stations are located on an island in the reservoir northwest of Erosion Stations # 4 and # 5. The area surveyed is along the south side of the island where the erosion is very severe. At the time of the survey, there was very little bank failure at the base of the cutbank which ranged in height from .5 meters to 4 meters. It appears that any bank failure that had occurred during the previous summer had already been washed away by the force of the waves. The beach is up to 15 meters wide and supports only a sparse scatter of vegetation.

Above the cutbank, Corps of Engineers property was heavily covered with prairie grasses. A stand of trees bordered the south end of the survey area. Erosion Station 12 A extends from A to B on Figure 15 and station 12 extends from C to D. The east end of 12 and all of 12 A were sloped to the east.

A general summary of the field investigations done is as

follows: 1) 5 shovel tests, 2) 200 meters of cutbank planing and inspection, and 3) 3000 square meters of beach reconnaissance. The following provides a more detailed description.

Inspection of Beach and Cutbank: Visual inspection of the cutbank and cutbank planing were done from A to D on Figure 15. No cultural material was found on the beach or in the cutbank as a result of visual inspection.

Shovel Testing: Five shovel tests were dug at these erosion stations. All of the shovel tests were dug in tall grasses where the ground surface visibility was less than 1 %.

Shovel Test # 1 is situated 15 meters back from the edge of the cutbank and 18 meters from the edge of the treeline on the north side of the survey area. Shovel Test # 2 is situated 14 meters back from the edge of the cutbank and 30 meters from the edge of the treeline. Shovel Test # 3 is situated 15 meters back from the edge of the cutbank and 45 meters from the edge of the treeline.

Shovel Test # 4 is situated 16 meters from the edge of the cutbank and 67 meters from the treeline. Shovel Test # 5 is situated 37 meters from the edge of the cutbank and 137 meters from the Shovel Test # 4. No cultural material was recovered from any of the pits at this erosion station (See Table 13).

TABLE 13: SUMMARY OF SHOVEL TESTS FROM EROSION STATION # 12 & 12A

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 15 cm.	16 - 25 cm	26 - 30 cm.	No
2	0 - 15 cm.	16 - 25 cm.	26 - 30 cm.	No
3	0 - 15 cm.		16 - 30 cm.	No
4	0 - 15 cm.	16 - 28 cm.	29 - 30 cm.	No
5	0 - 10 cm.	11 - 25 cm.	26 - 30 cm.	No

RELOCATION OF KNOWN SITES

Burial Mounds 21 OT 82

The Scope of Work for this project also included relocation and assessment of a group of seven burial mounds (See Appendix E, Plates 5, 6, and 7). These mounds (Figure 16), as recorded by Hudak (1981), are located on a lowland mudflat adjacent to the present Otter Tail River channel. The group consists of seven mounds ranging in size from 15 meters to 5 meters in diameter. Hudak (1981) placed a test excavation unit on the western side of the datum mound yielding bison bone, bird bones, unidentified bone, snail shell, charcoal, and fire treated granite.

Figure 15: Map of Erosion Stations 12 and 12 A

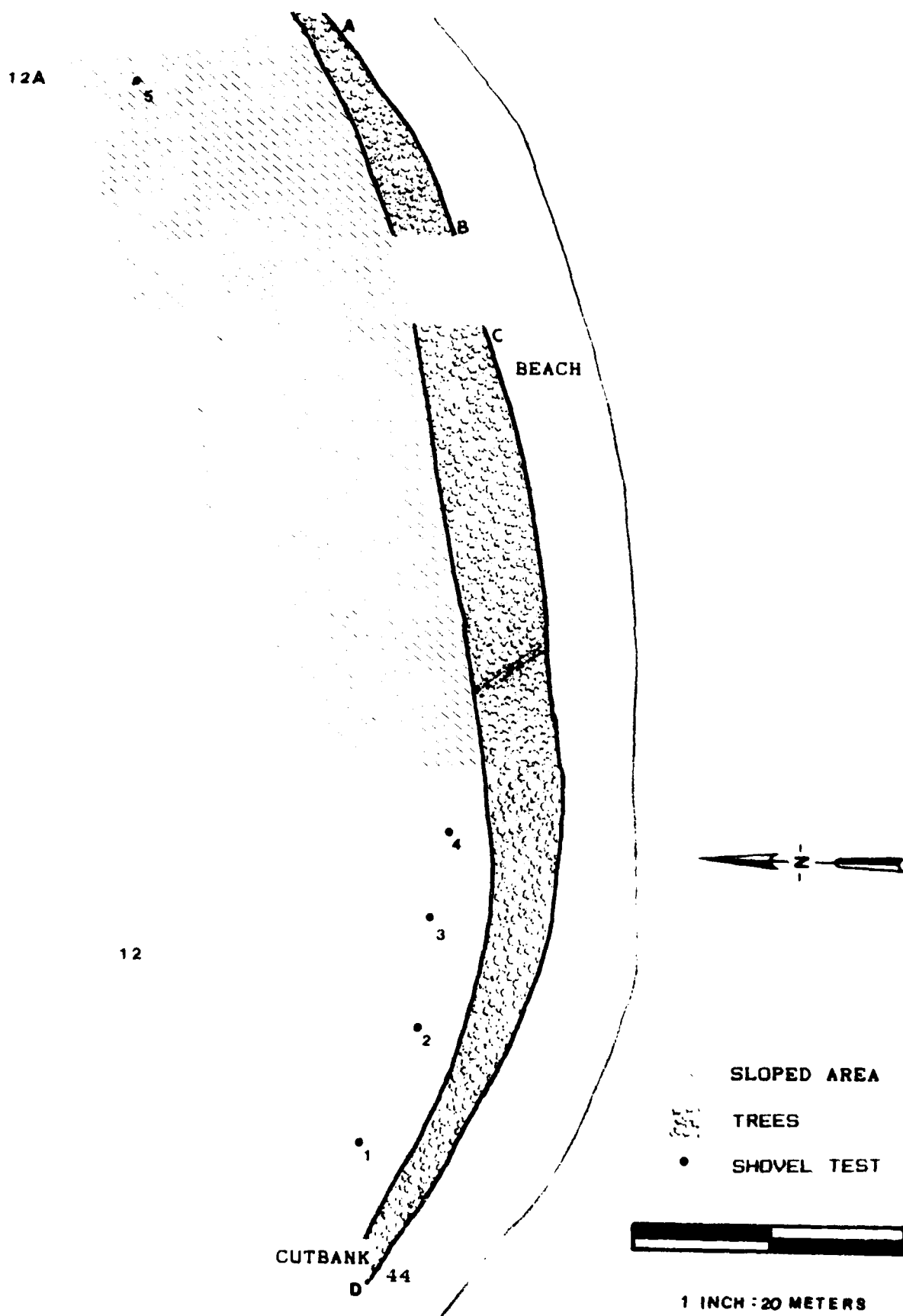
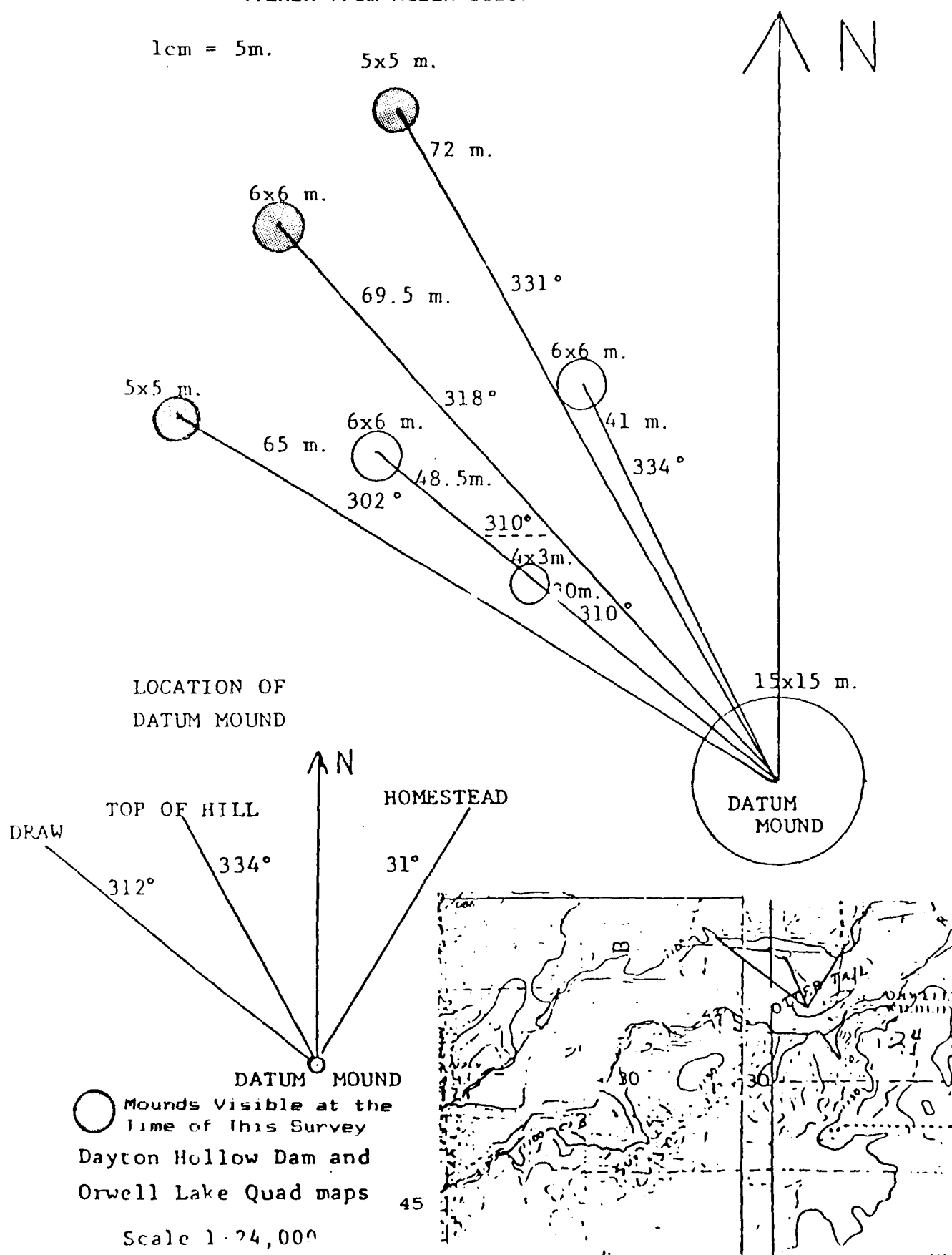


Figure 16: Relocation of Burial Mound Group
(Taken from Hudak 1981)



Relocation of the mounds was easily done from the south shore. Of the seven mounds, only three were visible. The others had either been washed level by wave action or were covered with tall marsh grasses. The three visible mounds were completely inaccessible. The water level of the reservoir was such that there was approximately 30-40 meters of water between the nearest mound and the shoreline. Closer examination needed to be done by boat.

Utilizing a boat, we were able to relocate the mound group and again only three of the smaller mounds were discernible. The other two small mounds and the datum mound have either eroded away or are situated in the tall marsh grasses that lined the shore.

The water was extremely shallow around each mound and in the general site area. Using a pole to push, we were able to position the boat beside one of the mounds. It was four meters in diameter and looked like a ridge of mud sticking out above the water level by 20 cm. There were three deep holes in the crown of the mound which were a result of "annual flooding, rodent disturbance, and apparent unauthorized excavation" (Hudak 1981:73). The pattern of erosion appears to be moving soil off the top of the mound and redepositing the soil onto the sideslopes. Thus, the mounds are getting lower and yet larger around the base.

Because of the shallow water, it was felt that forcing the boat (with three crew members aboard) to the other three visible mounds would extensively disturb the site.

Site 21 OT 81

Although not part of the requirements of the Scope of Work for this project, we were able to relocate the site found by Hudak (1981), Field Number R 02.0 and state site number 21 OT 81. This site is on the south shore of the reservoir adjacent to the confluence of the Otter Tail River and the Orwell Lake Reservoir.

The site is situated between Erosion Station # 7A and # 8A, thus we had the opportunity to relocate the site on the way to our survey area.

The shoreline at the site was 15 meters wide and heavily vegetated. Numerous trees were falling from the bank, held in place only by the root structure. There was evidence of recent bank failure which was massive. The processes of erosion are clearly evident at this site.

No cultural material was found on the beach or in the cutbank, both of which were intensively examined. Above the cutbank, there was a terrace to the north and west of the site area. This terrace was approximately 3 meters lower than the surrounding area and was covered with scattered trees. Five

shovel tests were dug along the ridge and two were placed on this terrace below. The adjoining corn field was also visually inspected. No cultural material was recovered from the surface of the field but three artifacts were recovered from the shovel testing.

Shovel Test # 1 is 15 meters south of the cutbank and Shovel Test # 2 is 15 meters south of the cutbank and 15 meters west of Shovel Test # 1. A chert scraper was found between 5 - 10 cm. and a chert flake was recovered between 20 and 30 cm. in Shovel Test # 2. Shovel Test # 3 was placed 15 meters south of Shovel Test # 2.

Shovel Test # 4 was placed 15 meters south of the cutbank and 15 meters west of Shovel Test # 2. Shovel Test # 5 was placed between Shovel Test # 2 and the cutbank in order to determine to distribution of the site. A flint retouch flake was recovered from this pit at 19 cm. Shovel Test # 6 was placed on the lower terrace north of Shovel Tests # 2, and 5. Shovel Test # 7 was also placed on the lower terrace 10 meters west of Shovel Tests # 6. No cultural material was recovered from this pit (See Table 14).

TABLE 14: 21 OT 81

Shovel Test #	Topsoil	Mixed	Clay	Artifacts Recovered
1	0 - 25 cm.		26 - 32 cm.	No
2	0 - 20 cm.	21 - 30 cm.	31 - 35 cm.	Yes
3	0 - 10 cm.	11 - 32 cm.	33 - 35 cm.	No
4	0 - 15 cm.	16 - 25 cm.	26 - 30 cm.	No
5	0 - 20 cm.		21 - 30 cm.	Yes
6	0 - 10 cm.	11 - 13 cm.	14 - 15 cm.	No
7	0 - 15 cm.	16 - 25 cm.	26 - 30 cm.	No

IV. CONCLUSION

This section of the report will be divided into four sections. The first will discuss erosion and its impact on cultural resources and the second will deal with the Erosion Stations that yielded no cultural material. The third section will deal with those Erosion Stations where cultural material was recovered. The last section will include the relocation of the burial mounds and site 21 OT 81.

Erosional Analysis

Between the time of dam construction in 1954 and 1977, several major erosional events had taken place at the Orwell Reservoir. Interest on the part of the Corps of Engineers in the over-all processes of reservoir erosion and the specific processes taking place at Orwell Lake, prompted the 1983 erosional study by John R. Reid of the University of North Dakota.

From a cultural resource management perspective, the erosion taking place at Orwell Lake is a destructive force that will, given time, significantly alter, damage, or totally destroy the archaeological resources found around the lake. For this reason, it is necessary to examine the erosional forces as outlined by Reid, determine the impact on known cultural resources, and outline short-term and long-term goals for the management and preservation of both known and unknown sites.

Erosion at Orwell Lake

The three processes of erosion taking place at the Orwell reservoir are rain, frost thaw, and waves. The first two processes are generally responsible for moving sediment to the base of steep slopes and subsequent wave action carries this sediment into the reservoir.

Wave Action: The dominant process of erosion at Orwell Lake is that of wave action accounting for 69 % of the total erosion during 1981-82 (Reid, 1983:86). Once there is bank failures at the base of the cutbank, the wave action works to gradually wash away the deposits. Obviously then, the higher the pool level, the stronger the waves resulting in greater wave erosion. The direction, duration, and strength of the wind is also a factor in determining the intensity and ratio of wave erosion.

Frost Thaw: Thaw failure is the second most dominant process of erosion at Orwell Lake accounting for 27 % of the total erosion. It is more significant on the south shore (north face) banks of the lake rather than the north shore (south-face) due to higher moisture content. Indeed, 75 % of the thaw failure is evident on the south shore (north face) areas. The near vertical cracks observed on the south shore are a result of sublimation of

segregated ice. The slabs slip along frost-enhanced surfaces and serve as channels for snowmelt.

Rainfall: Both the rainfall intensity (rainplash) and the resultant overland flow comprise slightly more than 3 % of the total erosion at Orwell Lake. According to Reid (1983), there is a causal relationship between summer rainfall and slope erosion. However, the delays between rainfall event and actual measurement did not allow for statistical validity. Also, rainfall amounts were not measured accurately enough to be statistically valid. However, the data that was collected suggests that the north shore (south-face) with higher precipitation had less erosion than the south shore.

Impact On Cultural Resources Above the Outbank: The type and intensity of erosion effecting the shoreline changes from season to season, year to year. Reid (1983) suggests that thirty five percent of the total shoreline at Orwell Lake has been impacted by erosion in some form. With a very wet spring or a very windy fall this percentage could significantly increase resulting in negative impact on cultural resources above the outbank. This is significant when considering that only a small portion of the total upland perimeter of the reservoir has been surveyed. It is possible that future researchers may locate significant archaeological sites outside of the perimeters of this survey that otherwise would be negatively subjected to erosional damage.

Erosion Stations with Negative Results

Although each Erosion Station has been subjected to some level of damage by various erosional processes. Erosion Stations # 1, 2, and 3 have been severely disturbed. Erosion Station # 1 evidenced damage and alteration as a result of building construction, placement of rock and wood piles, etc. Erosion Stations # 2 and 3 are subjected to severe wave erosion which will completely remove the remaining small point resulting in a rounded shoreline.

The remaining survey areas include Erosion Stations # 4, 5, 7, 7 A, 9, 10, 11, 12, and 12 A. No artifacts or features were found at any of these areas. Based upon the lack of artifactual material as a result of visual reconnaissance of the shoreline, and upland open areas, cutbank planing, and subsurface shovel testing, it appears that proposed bank stabilization should have no effect on cultural resources.

Erosion Stations with Positive Results

Erosion Station # 6 (21 OT 91): All of the artifacts from this site were found in the corn field south of the Corps property line. No artifacts were recovered from the shovel tests placed in the tall grass on Corps property. No shovel tests were placed within the corn field, making the determination of the

depth of cultural deposit impossible. The distribution of artifacts from the surface was fairly uniform covering an area of approximately 40 meters by 70 meters. Considering, however, that only 23 artifacts were recovered, the site appears to be quite small. Subsurface testing outside of Corps of Engineers property would be required to be done to make that determination. Because the site is outside of Corps property and was not yet harvested, this additional subsurface testing was not done.

Erosion Station # 8 (21 OT 92): This site yielded 4 artifacts from the subsurface testing and 9 artifacts from the surface of the adjoining corn field. The site covers an area of 30 meters by 90 meters, thus, the distribution of cultural material is very thin. The depth of the cultural deposit is determined only by the artifacts found in the shovel tests. All of the artifacts recovered were between 10 cm. and 20 cm. No diagnostic artifacts were recovered from the site. A projectile was recovered from the corn field but the tip and base were broken, making cultural affiliation impossible to determine. The lithics recovered from the site include chert, flint, and quartz.

The site appears to be a very thin lithic scatter. Artifacts were found in Shovel Test # 2 and # 3, yet there was no artifactual material found during visual inspection or planing of the cutbank.

Erosion Station # 8 A (21 OT 93): This site yielded 7 artifacts from the subsurface testing and 37 artifacts from the surface of the adjoining corn field. The site covers an area of 30 meters by 90 meters. The depth of the cultural deposit is determined only by the artifacts found in the shovel tests. All of the artifacts recovered were between 0 cm. and 28 cm.

In terms of diagnostic artifacts, three body sherds were found indicating a generalized cultural affiliation of "Woodland." The lithics recovered from the site are of a variety of stone materials including Knife River flint, chert, flint, jasper, chalcedony, and quartz. No diagnostic lithic artifacts were found.

Because the frequency of artifacts recovered from the site appears to be very sparse, and none of those artifacts recovered are diagnostic, it is difficult to determine site affiliation. Moreover, on archaeological sites with low artifact densities, it is likewise difficult to determine accurate site boundaries. Artifacts were found in Shovel Test # 1, 2 and 4, yet there was no artifactual material found during visual inspection or planing of the cutbank. Intensive testing may make such determinations possible.

Relocation of Burial Mounds 21 OT 82: Since access to the group of burial mounds was possibly by boat only and most of the mounds were completely inundated, it is impossible to make exact determinations as to the current condition of each mound, the degree and extent of erosional damage, and the content of each

mound.

Site 21 OT 81: Although not part of the specifications for this project, this site was relocated and examined. Artifactual material was found in only two of the shovel tests within 15 meters of the cutbank. Hudak (1981) indicates that the site is located in the corn field and is 30 meters by 50 meters in size. On the basis of our subsurface testing, it is evident that the site extends from the top of the ridge in the field to the very edge of the cutbank. The subsurface testing yielded three artifacts above 20 cm.

V. RECOMMENDATIONS

As a result of this survey, several actions are recommended that would protect archaeological sites currently being damaged by erosion. This includes both the currently known sites as well as other sites that have not yet been located.

- 1) At Erosion Station # 6 (21 OT 91) the northern portion of the site area appears to be between 15 and 30 meters from the current edge of the cutbank. It, therefore, does not appear to be in immediate danger of erosional damage. Based upon the distance of the site to the edge of the cutbank, it appears that proposed bank stabilization should have no effect on this site and if successful may ultimately preserve and protect the site for future analysis.
- 2) At Erosion Station # 8 (21 OT 92), it is necessary to make every effort to protect the cutbank in order to prevent further erosional episodes. Such stabilization efforts may impact a small portion of the site in this area, however, the impact of stabilization efforts could be less damaging than the impact of continued erosional episodes.
- 3) At Erosion Station # 8 A (21 OT 93), it is necessary to make every effort to protect the cutbank in order to prevent further erosional episodes. Such stabilization efforts may impact a small portion of the site in this area, however, the impact of stabilization efforts could be less damaging than the impact of continued erosional episodes.
- 4) Because the burial mounds were accessible only by boat and a thorough determination of their condition could not be made, it is recommended that a qualified archaeologist make such a determination when the pool level allows access to the mounds.
- 5) At 21 OT 81, it is necessary to make every effort to protect the cutbank in order to prevent further erosional episodes. Such stabilization efforts may impact a small portion of the site in this area, however, the impact of stabilization efforts could be less damaging than the impact of continued erosional episodes.
- 6) Throughout his report, Reid (1983) discusses the effects of overland erosion, wave erosion, frost penetration and heave, and thaw failure. As discussed above, these processes have impacted a significant percentage of the Orwell Lake shoreline resulting in damage to known archaeological sites. On this basis, it is not difficult to project that other archaeological sites not yet known are being impacted.

Thus, it is strongly recommended that the Corps of Engineers initiate plans for a Phase I survey of the entire perimeter of Orwell Lake. This survey should include surface

reconnaissance and subsurface testing (including inspection of the cutbank for eroding cultural material which must be considered part of the survey methodologies) of all unsurveyed Corps of Engineers property from the edge of the cutbank to the edge of Corps property. Specifically the entire perimeter of the reservoir as well as the channel to the northwest toward Dayton Hollow Dam and the channel south of the reservoir should be examined. Completing such a survey would identify the frequency and extent of prehistoric utilization of the area and enable the Corps of Engineers to make timely management decisions in order to protect the archaeological record of Lake Orwell.

- 7) If surveying the entire shoreline of the reservoir is not possible, it is strongly recommended that the following areas be given the highest priority.

- A) According to Reid, areas with a north face (south shore) are subjected to greater erosional damage than areas facing south (north shore). This is not to suggest that the rest of the perimeter need not be surveyed. Rather, it should be utilized as a framework for determining what areas demand immediate attention and what areas require attention but not immediately. Figure 17 outlines five priority areas around the perimeter of the lake.

- B) Figure 17 is a topographic map of the entire Orwell Lake. It is recommended that the two areas in Section 25 be given the highest priority and the other three areas be given medium priority in the management sequence of the lake. From visual inspection, these areas are being subjected to annual erosional episodes and require archaeological survey to determine the presence or absence of cultural material.

- 8) Aerial infrared photography in archaeology has been proven to be a valuable tool in archaeological analysis (Pany, 1971; Lyon, 1964; Harp, 1975; Blanchard, 1974; Gummerman, 1971).

- A) Cultural Resources: Aerial infrared photography can be utilized as a tool in determining the potential for site location. Subsurface (or barely visible) features absorb and/or emit thermal energy at a different ratio than the surrounding area, thus, creating a tonal contrast on the infrared photographs. Gummerman (1971) states that "Aerial photography has assisted the archaeologist in many ways, but there are several areas of critical concern in which aerial photography has been of inestimable help. These major categories include 1) site discovery, 2) prediction of site locality, 3) reconstruction of environments, 4) explanation of environmental adaptation, and 5) dating of cultural features."

- B) Erosional Analysis: Aerial photography is a very useful tool for viewing the erosional patterns of a given

ORWELL LAKE, MINN.

NE 4 WENDELL 15 QUADRANGLE
N4607.5-W9600.7 5

1973

DAYTON HOLLOW DAM, MINN.

NE 4 WENDELL 15 QUADRANGLE
N4607.5-W9600.7 5

1973

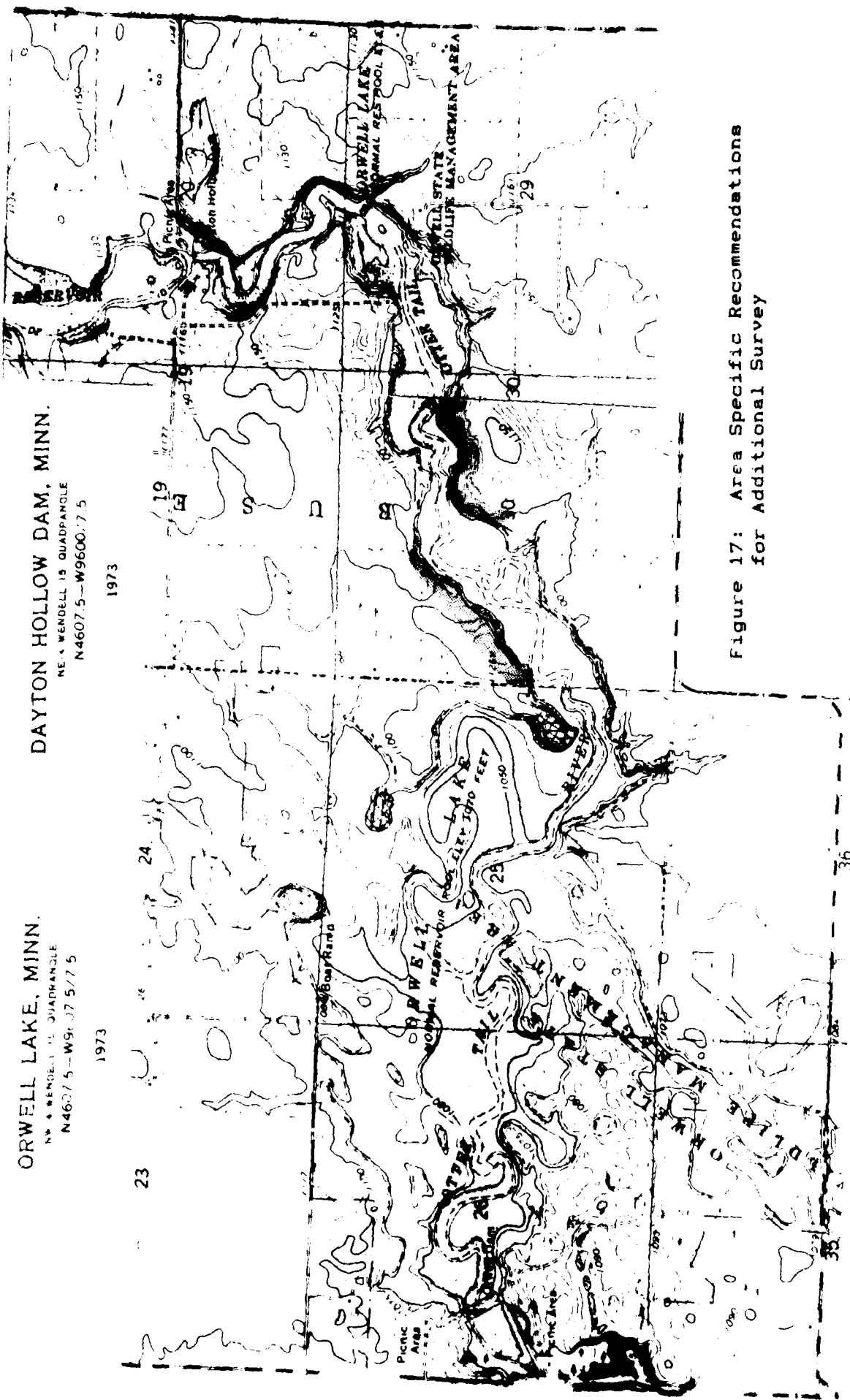


Figure 17: Area Specific Recommendations
for Additional Survey

High Priority Medium Priority

area on a scale that is often not visible by visual inspection. This is particularly evident with the use of aerial infrared photographs, which aid in the easy location of newly eroded sterile subsurface horizons. By comparing the photographs from year to year, a general assessment of the progression of erosional damage in a given area can be examined. It is recommended, therefore, that the Corps of Engineers begin a program of routine aerial photographs at no more than a five year interval.

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APPENDIX A: ARTIFACT INVENTORY

ARTIFACT INVENTORY

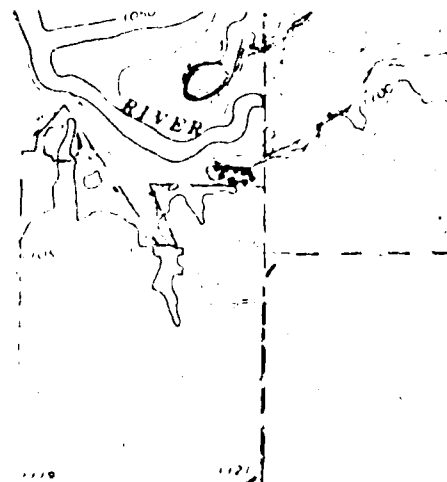
SITE NUMBER	ARTIFACT NUMBER	LOCATION	DESCRIPTION
RO 2	49001	Test Pit 5	Flint Flake
RO 2	49002	Test Pit 2	Chert Scraper
RO 2	49003	Test Pit 2	Chert Flake
21 OT 91	49004	Surface 19 M. South & 12 M. West of T. P. # 2	Flint Flake
21 OT 91	49005	Surface 10 M West of T.P. #3	Knife River Blade
21 OT 91	49006	Surface 15 M. West of T.P.#3	Chert Flake
21 OT 91	49007	Surface 15 M. West of T.P.#3	Chert Flake
21 OT 91	49008	Surface 15 M. West of T.P.#3	Flint Flake
21 OT 91	49009	Surface East End Row 1-7	Flint Fragment
21 OT 91	49010	Surface East End Row 1-7	Body Sherd CWP
21 OT 91	49011	Surface Row 1-13	Chert Flake
21 OT 91	49012	Surface Row 1-13	Flint Flake
21 OT 91	49013	Surface Row 1-13	Chert Scraper
21 OT 91	49014	Surface Row 1-13	Chert Flake
21 OT 91	49015	Surface Row 1-13	Flint Fragment
21 OT 91	49016	Surface Row 1-13	Chalcedony Flake
21 OT 91	49017	Surface Row 1-13	Chert Fragment
21 OT 91	49018	Surface Row 13-27	Chert Flake
21 OT 91	49019	Surface Row 13-27	Chert Flake
21 OT 91	49020	Surface Row 13-27	Chert Flake
21 OT 91	49021	Surface Row 13-27	Flint Flake
21 OT 91	49022	Surface Row 13-27	Knife River Util. Flake
21 OT 91	49023	Surface Row 13-27	Knife River Flint Flake
21 OT 91	49024	Surface Row 13-27	Chert Utilized Flake
21 OT 91	49025	Surface Row 13-27	Quartz Fragment
21 OT 91	49026	Surface Row 13-27	Body Sherd CWP
21 OT 92	49027	Surface of Cornfield	Flint Utilized Flake
21 OT 92	49028	Surface of Cornfield	Chert Utilized Flake
21 OT 92	49029	Surface of Cornfield	Fling Flake
21 OT 92	49030	Surface of Cornfield	Flint Projectile Midsection
21 OT 92	49031	Surface of Cornfield	Flint Flake
21 OT 92	49032	Surface of Cornfield	Chert Flake
21 OT 92	49033	Surface of Cornfield	Chert Flake
21 OT 92	49034	Surface of Cornfield	Flint Fragment
21 OT 92	49035	Surface of Cornfield	Quartz Flake
21 OT 92	49036	T. P. #2 10-20 cm.	Flint Flake
21 OT 92	49037	T. P. #2 10-20 cm.	Chert Flake
21 OT 92	49038	T. P. #3 15-20 cm.	Quartz Flake
21 OT 92	49039	T. P. #3 15-20 cm.	Flint Flake

SITE NUMBER	ARTIFACT NUMBER	LOCATION	DESCRIPTION
21 OT 93	49040	Surface	Quartz Flake
21 OT 93	49041	Surface	Quartz Flake
21 OT 93	49042	Surface	Quartz Flake
21 OT 93	49043	Surface	Quartz Flake
21 OT 93	49044	Surface	Quartz Flake
21 OT 93	49045	Surface	Chert Flake
21 OT 93	49046	Surface	Chert Flake
21 OT 93	49047	Surface	Chert Flake
21 OT 93	49048	Surface	Chert Flake
21 OT 93	49049	Surface	Chert Flake
21 OT 93	49050	Surface	Chert Flake
21 OT 93	49051	Surface	Chert Flake
21 OT 93	49052	Surface	Chert Flake
21 OT 93	49053	Surface	Chert Flake
21 OT 93	49054	Surface	Chert Flake
21 OT 93	49055	Surface	Flint Fragment
21 OT 93	49056	Surface	Flint Fragment
21 OT 93	49057	Surface	Flint Flake
21 OT 93	49058	Surface	Flint Flake
21 OT 93	49059	Surface	Flint Flake
21 OT 93	49060	Surface	Flint Flake
21 OT 93	49061	Surface	Flint Flake
21 OT 93	49062	Surface	Flint Flake
21 OT 93	49063	Surface	Flint Flake
21 OT 93	49064	Surface	Flint Flake
21 OT 93	49065	Surface	Flint Flake
21 OT 93	49066	Surface	Flint Flake
21 OT 93	49067	Surface	Flint Flake
21 OT 93	49068	Surface	Flint Flake
21 OT 93	49069	Surface	Flint Flake
21 OT 93	49070	Surface	Jasper Utilized Flake
21 OT 93	49071	Surface	Chert Utilized Flake
21 OT 93	49072	Surface	Flint Scraper
21 OT 93	49073	Surface	Flint Side Scraper
21 OT 93	49074	Surface	Body Sherd Smooth
21 OT 93	49075	Surface	Body Sherd Smooth
21 OT 93	49076	Surface	Body Sherd CWP
21 OT 93	49077	T. P. # 1 20 cm.	Flint Flake
21 OT 93	49078	T. P. # 1 25 cm.	Quartz Flake
21 OT 93	49079	T. P. # 1 25 cm.	Quartz Flake
21 OT 93	49080	T. P. # 1 25 cm.	Knife River Flake
21 OT 93	49081	T. P. # 1 28 cm.	Unidentified Bone
21 OT 93	49082	T. P. # 2 20 cm.	Flint Flake
21 OT 93	49083	T. P. # 4 0-10 cm.	Utilized Flint Flake
21 OT 92	49085	T. P. # 4 32 cm.	Flint Flake

APPENDIX B: STATE SITE FORMS

SITE LOCATED OUTSIDE PROJECT AREA

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY Otter Tail	SITE NAME Corps owned "Farm Field" Control #17	FIELD NUMBER 02.0	STATE NUMBER 21 OT 81
OWNER U.S. Army Corps of Engineers		U.S.G.S. QUAD Orwell Lake Quad 1:24000	
SITE LOCATION See attached sheet		LEGAL DESCRIPTION SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 25 T132N R44W	
SITE TYPE Woodland		PROBABLE CULTURAL COMPONENTS: Prehistoric (see artifacts recovered)	
SITE DESCRIPTION See attached sheet			
SITE CONDITION The present condition of the site appears good. However, extremely sharp banks are eroding and could disturb the northern portion of site in the future.		CURRENT LAND USE The field is presently cultivated and planted with corn. The depth and preservation of the cultural zones in this field were not determined	SITE AREA 50 x 30 meters (see comments)
LOCATION OF NEAREST WATER adjacent to the confluence of the Otter Tail River & Orwell Lake Reservoir - also adjacent to the former Otter Tail River bed		DISTANCE TO WATER See Elev. fluctuation in comments Site to Reservoir 200' Site to river bed 400'	DIRECTION OF SITE FROM WATER 180°
ELEVATION OF SITE: 1100' - 1110'		ELEVATION OF NEAREST WATER: at date of survey 1059.15'	
NATURE, EXTENT OF INVESTIGATION: Reconnaissance level survey utilizing surface examination only			
ARTIFACTS OBSERVED, <u>RECOVERED</u> : See attached sheet			
LOCAL COLLECTIONS, INFORMANTS: None known		MAP SCALE: 1-24000 MAP 	
WRITTEN REFERENCES None			
COMMENTS: Surface visibility was excellent and information gained by surface examination was sufficient for site nomination. The site area is only approximate because subsurface testing outside of our survey area (which this one was) was not included in the scope of work. Due to the function of flood control, the water level in this Reservoir can vary at least 15' creating fluctuations in site to water distance			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: PROJECT: Orwell Lake Project	INVESTIGATORS: G. J. Hudak H.C. Pedersen T.J. O'Brien DATE: Wk. of 5/1 & 6/29/81

Site Location: The site is located approximately 3/16th of a mile north of a farm road which runs along the southern border of Section 25. County Road 114 runs along the southern border of Section 30, R43W and turns south at the intersection of said farm road. Follow the farm road for 100 meters. Walk from this point 0° to the bluff.

Site Description: The site is located atop a bluff overlooking the former Otter Tail River bed at an elevation of 1100' - 1110'. The artifacts were located on the surface of a cultivated farm field which extends to the bluff. The top of the bluff is at least 30-50' above the present Orwell Lake Reservoir. This height combined with its location at the south side of the confluence of the Otter Tail River and Orwell Lake provide an excellent view up the river and down the former Otter Tail River bed. A draw is located just west of the sight providing good access to the former river bed.

Artifacts Recovered:

- 1 Fragmented white chert basal side notched projectile point
- 2 white chert flakes
- 1 tan chert flake
- 1 pink chert flake
- 1 knife river flint end scraper (fragment)
- 1 tan oolithic chert end scraper
- 1 red jasper end scraper
- 3 grit tempered cord impressed body sherds
- 1 unidentified possible Bison bone fragment
- 1 possible hammerstone

1986: The site was relocated by Impact Services during an archaeological survey for the Corps of Engineers. There was evidence of severe erosional damage at the site. No cultural material was recovered from the beach or in the cutbank. Five shovel tests were dug along the ridge above the cutbank and two were placed on the terrace below. A chert scraper, a flint retouch flake, and a chert flake were recovered from the shovel tests. Additional information about the site is available from Mankato State University Museum of Anthropology where the artifacts and field notes are curated or from Impact Services.

MINNESOTA STATE SITE FILE FORM

All information requested here must be supplied if available. Additional data can be recorded on sheet 2 or by supplying copies of field forms.

MINNESOTA STATE SITE FILE

County Otter Tail Project Survey at Orwell Reservoir

Site # 21 OT 91 Date of investigation October, 1965

Site name _____ Field # U. S. # 6

Type of site Possible short-term habitation

Cultural affiliation Woodland

Location NE 1/4 of SW 1/4 of SE 1/4 of SEC 2 T 132N R 44W

Verbal South shore of Orwell Lake adjacent to former Otter Tail River channel

Nearest water-direction-distance Adjacent to Orwell Lake

Owner/tenant- address U. S. Army Corps of Engineers

Informants/collections None

Site description Site is located on bluff above Orwell Lake. Artifacts found in corn

Present condition field south of Corps property Condition is good but erosion is

Excavations severe along cutbank to the north None

Repository Bankato State photo #s _____ accession #s _____

National Register status; unevaluated x evaluated _____ submitted _____ approved _____

Written references Cultural Resource Survey at Orwell Reservoir, Otter Tail Co, MN

as per Corps of Engineers, St. Paul District

USGS Quad Dayton Hollow Dam Scale 7.5 Minute (1:24,000)



Comments _____

Legend:

Site area is indicated by shading.
Shading is much larger than site in order for reader to easily find the site.

Recorded by Kathleen A. Roetzel

Institution Impact Services date 12-10-65

MINNESOTA STATE SITE FILE FORM

All information requested here must be supplied if available. Additional data can be recorded on sheet 2 or by supplying copies of field forms.

MINNESOTA STATE SITE FILE

County Otter Tail

Project Survey at Orwell Reservoir Erosion Stations

Site # 21 OT 92

Date of investigation October, 1985

Site name _____

Field # E. S. # 8

Type of site Appears to be a lithic scatter

Cultural affiliation Unknown

Location SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of SE $\frac{1}{4}$ $\frac{1}{4}$ SEC 25 T 132N R 44W

Verbal South shore of Lake Orwell adjacent to former Otter Tail River channel

Nearest water-direction-distance Adjacent to Orwell Lake

Owner/tenant- address U. S. Army Corps of Engineers

Informants/collections None

Site description Site is located on a bluff above Orwell Lake. Artifacts were found on surface in cornfield and in shovel testing

Present condition Condition is good but erosion is severe along cutbank to north

Excavations None

Repository Mankato State photo #s _____ accession #s _____

National Register status; unevaluated ☒ evaluated _____ submitted _____ approved _____
DATE DATE DATE

Written references Cultural Resource Survey at Orwell Reservoir, Otter Tail Co, MN as per Corps of Engineers, St. Paul District

SSS Quad Dayton Hollow Dam

Scale 7.5 Minute (1:25,000)



Comments _____

Legend:

Site area is indicated by shading.
Shading is much larger than site in order for reader to easily find the site.

Recorded by Kathleen A. Boetzel

Institution Impact Services date 12-10-85

MINNESOTA STATE SITE FILE FORM

The information solicited here should be supplied if it is pertinent. Field reports may serve as supplements.

County Otter Tail Project Survey at Orwell Reservoir

Site # _____ Date of investigation October, 1985

Site name _____ Field # E. S. # 8

UTM: A _____ B _____

C _____ D _____

Best access to site At SE corner of Sec. 25 where Co. Rd. # 2 turns south, follow field road west. Just before ravine, walk corn field north to lake then east
Sites in vicinity to site See Report

Previous work in area Hudak's shoreline survey 1981

Site area/ dimensions 30 meters by 90 meters

Disturbance-nature of Southern portion of site is under cultivation and northern portion of site may be disturbed by cutbank erosion in future

Elevation of site 1100' of nearest water 1975'

Drainage system Orwell Lake

Topography Atop bluff adjacent to Orwell Lake. Topography falls off east west side of the site

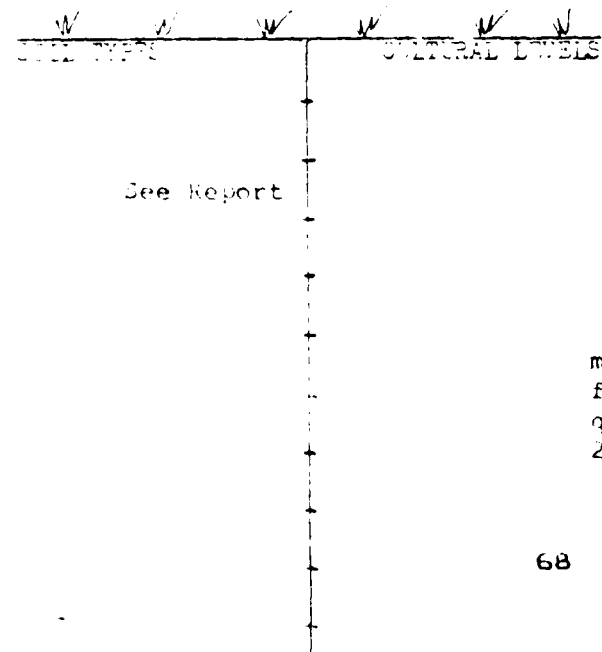
Vegetation South end - plowed North end - prairie grasses

Soil types _____

Region (geomorphic, biophysical) _____

SOIL PROFILE

Indicate typical cultural horizons and stratigraphy, scale



Principal investigator, crew R. Strachan, M. Roetzel, L. E.erson, J. O'Gorman, J. Evanson, C. Broate, M. Loveall

Nature and aim of investigation reconnaissance level survey required by COE due to proposed bank stabilization. Also relocation of burial mounds found during previous survey.

Research potential Medium

Artifacts recovered Surface: 1 flint projectile midsection only, 1 flint & 1 chert utilized flake, 2 flint flakes, 2 chert flakes, 1 quartz flake, 1 flint fragment. Subsurface: 2 flint flakes, 1 chert flake, 1 quartz flake

68 Recorded by Wahneema Lubiano A. Roetzel

Institution Impact Services Date 1-1-86

MINNESOTA STATE SITE FILE FORM

All information requested here must be supplied if available. Additional data can be recorded on sheet 2 or by supplying copies of field forms.

MINNESOTA STATE SITE FILE

County Otter Tail Project Survey at Orwell Reservoir Erosion Stations

Site # 21 OT 93 Date of investigation October, 1985

Site name _____ Field # E. S. # 3 A

Type of site Probable short term habitation

Cultural affiliation Woodland

Location NE 1/4 of SE 1/4 of SE 1/4 SFC 25 T 132N R 4E

Verbal Site is located on south shore of Orwell Lake at the confluence of reservoir and Otter Tail River. Site is adjacent to former channel.

Nearest water-direction-distance Adjacent to Orwell Lake

Owner/tenant- address U. S. Army Corps of Engineers

Informants/collections None

Site description Site is located atop a large rolling bluff above Orwell Lake.

Artifacts were found on surface of corn field and in shovel testing

Present condition Condition is good but erosion is severe along embank to north

Excavations None

Repository Minnesota State photo #s _____ accession #s _____

National Register status; unevaluated ☒ evaluated _____ submitted _____ approved _____

Written references Cultural Resource Survey at Orwell Reservoir, Otter Tail, Co.,
Mn. as per Corps of Engineers, St. Paul District

USGS and Dayton Hollow Dam Scale 7.5 Minute (1:24,000)



Comments _____

Legend:

Site area is indicated by shading.
Shading is much larger than site in order for reader to easily find the site.

Recorded by Kathleen A. Coetzel

Institution Impact Services date 12-10-85

MINNESOTA STATE SITE FILE FORM

The information solicited here should be supplied if it is pertinent. Field reports may serve as supplements.

County Otter Tail Project Survey at Orwell Reservoir

Site # _____ Date of investigation October, 1985

Site name _____ Field # E. S. # 8 A

UTM: A _____ B _____

C _____ D _____

Best access to site At SE corner of Sec. 25 where Co. Rd. # 2 turns south, follow field road west. Just before ravine, walk corn field north to lake then Sites in vicinity east to site See report

Previous work in area Hudak's shoreline survey 1981

Site area/ dimensions 30 meters by 90 meters

Disturbance-nature of Eastern portion of site is under cultivation and western portion of site is in prairie grasses. The north may be disturbed by erosion.

Elevation of site 1180' of nearest water 1075'

Drainage system Orwell Lake

Topography Site is atop large rolling bluff adjacent to lake. Topography falls off to the south, west, and east

Vegetation East end - plowed West end - prairie grasses

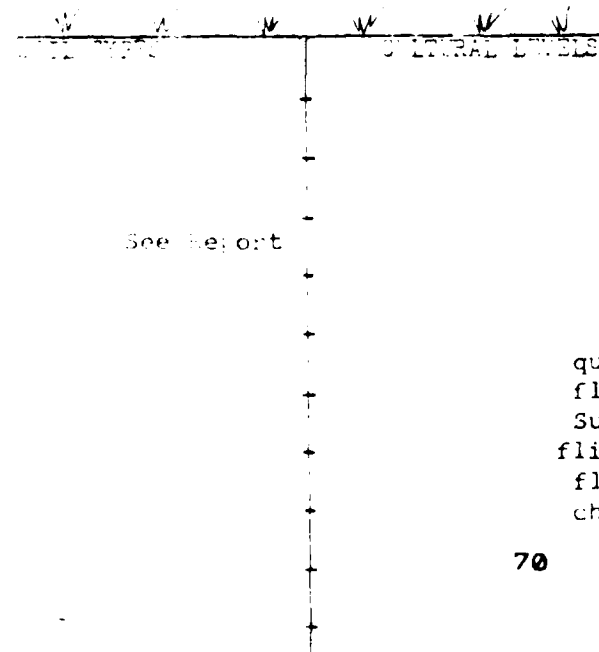
Soil types _____

Region (geomorphic, biophysical) _____

SOIL PROFILE

Indicate typical cultural horizons and stratigraphy, scale

Principal investigator, crew J. Strachan F. Roetzel P. Emerson, J. O'Gorman, J. Evanson, C. Froste, M. Loveall



Nature and aim of investigation reconnaissance level survey required by COE due to proposed bank stabilization. Also relocation of burial mounds found during previous survey.

Research potential Medium

Artifacts recovered Subsurface: 2 flint flakes, 2 quartz flakes, 1 knife river flake, 1 flint util. flake, unidentifiable bone fragments (non-human)
Surface: 1 body sherd (CWP), 2 smooth sherds, 1 flint side scraper, 1 flint scraper, 1 chert util. flake, 1 jasper util. flake, 13 flint flakes, 10 chert flakes, 2 flint fragments, 5 quartz flakes

70 Recorded by Kathleen A. Roetzl

Institution Impact Services Date 12-10-85

APPENDIX C: SCOPE OF WORK

SCOPE OF WORK
CULTURAL RESOURCES INVESTIGATION
ORWELL RESERVOIR,
OTTER TAIL COUNTY, MINNESOTA

1.00 INTRODUCTION

1.01 The Contractor will undertake a cultural resources investigation of the Orwell Reservoir in southwestern Ottertail County, Minnesota.

1.02 This cultural resources inventory partially fulfills the obligations of the Corps of Engineers (Corps) regarding cultural resources, as set forth in the National Historic Preservation Act of 1966 (P.L. 89-665), as amended; the National Environmental Policy Act of 1969 (P.L. 91-190); Executive Order 11593 for the "Protection and Enhancement of the Cultural Environment" (Federal Register, 13 May 1971); the Archaeological and Historical Preservation Act of 1974 (P.L. 93-291); the Advisory Council on Historic Preservation "Regulations for the Protection of Historic and Cultural Properties (36 CFR Part 800); the Department of the Interior guidelines concerning cultural resources (36 CFR Part 60); and the applicable Corps regulations (ER 1105-2-50).

1.03 The laws listed above establish the importance of Federal leadership, through the various responsible agencies, in locating and preserving cultural resources within project areas. Specific steps to comply with these laws, particularly as directed in P.L. 93-291 and E.O. 11593, are being taken by the Corps " . . . to assure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural, or archaeological significance." A part of that responsibility is to locate, inventory, and nominate to the Secretary of the Interior all such sites in the project area that appear to qualify for listing on the National Register of Historic Places.

1.04 Executive Order 11593 and the 1930 amendments to the National Historic Preservation Act further direct Federal agencies " . . . to assure that any federally owned property that might qualify for nomination is not inadvertently transferred, sold, demolished or substantially altered." In addition, the Corps is directed to administer its policies, plans, and programs so that federally and non-federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved and maintained for the inspiration and benefit of the people.

1.05 This cultural resources investigation will serve several functions. The report will be a planning tool to aid the Corps in meeting its obligations to preserve and protect our cultural heritage. It will be a comprehensive, scholarly document that not only fulfills federally mandated legal requirements but also serves as a scientific reference for future professional studies. It will identify sites that may require additional investigations and that may have potential for public-use development. Thus, the report must be analytical in nature, not just descriptive.

2.00 PROJECT DESCRIPTION

2.01 Orwell Dam is in westcentral Minnesota, about 190 miles northwest of St. Paul and about 6 miles southwest of Fergus Falls, Minnesota (see figure 1). The dam is on the Otter Tail River, 33 miles upstream of the point where the Otter Tail and Bois de Sioux Rivers combine to form the Red River of the North.

2.02 The Orwell Dam is part of a comprehensive plan for the Red River of the North basin authorized by Flood Control Acts approved on June 30, 1948, and May 17, 1950. Construction of the dam began in May 1951, and operation began in spring 1953. A contract for additional recreation facilities was completed in August 1971. The principal project features are the homogeneous rolled earth-fill embankment, combined spillway and outlet structure, and two low perimeter dikes.

2.03 The Federal Government owns about 1,985 acres of land in connection with the project (to about elevation 1,073 feet msl). About 1,870 acres are leased to the Minnesota Department of Natural Resources for wildlife management. Recreational opportunities at Orwell Reservoir are oriented toward sightseeing and nature study. Day-use recreation facilities are located at the damsite. Hunting (waterfowl, white-tail deer, pheasant, partridge, and fox), sightseeing, nature study, and picnicking are among recreational opportunities available at the project. Road access and parking are provided near the dam. Some canoeing and inner-tube rafting occurs on the Otter Tail River downstream from Orwell Dam.

2.04 A considerable amount of shore erosion has occurred since Orwell Lake was first impounded. Steep banks have developed on about 35 percent of the high water shoreline of the main lake; many of the banks are nearly vertical. Erosion has apparently progressed to outside project lands in one area and a land exchange is being considered to correct that problem.

2.05 A report entitled Shoreline Erosion Process, Orwell Lake, Minnesota, by John R. Reid, University of North Dakota, was prepared in January 1983. That 2-1/2-year study was conducted to determine the causes of bank erosion in the lake and ways to slow its rate and magnitude. The report identified wave action accompanying high pool levels and, to a lesser extent, freeze-thaw and rainfall as the primary processes of erosion. The report recommended lowering the normal full pool from 1070 to 1067.9 msl and vegetating the slopes that would require some grading of the existing slopes. The effects of bank erosion on storage capacity and the useful life of the new reservoir is being reviewed during an operating plan evaluation now underway by the St. Paul District.

2.06 In November 1981, a draft report entitled Cultural Resources Investigation of Orwell Reservoir, Otter Tail County, Minnesota was prepared under contract with the St. Paul District. Four sites were identified (figure 2), one of which was a burial mound group (7 mounds; field number 03.0). The final report of this investigation was never finalized, however, the draft

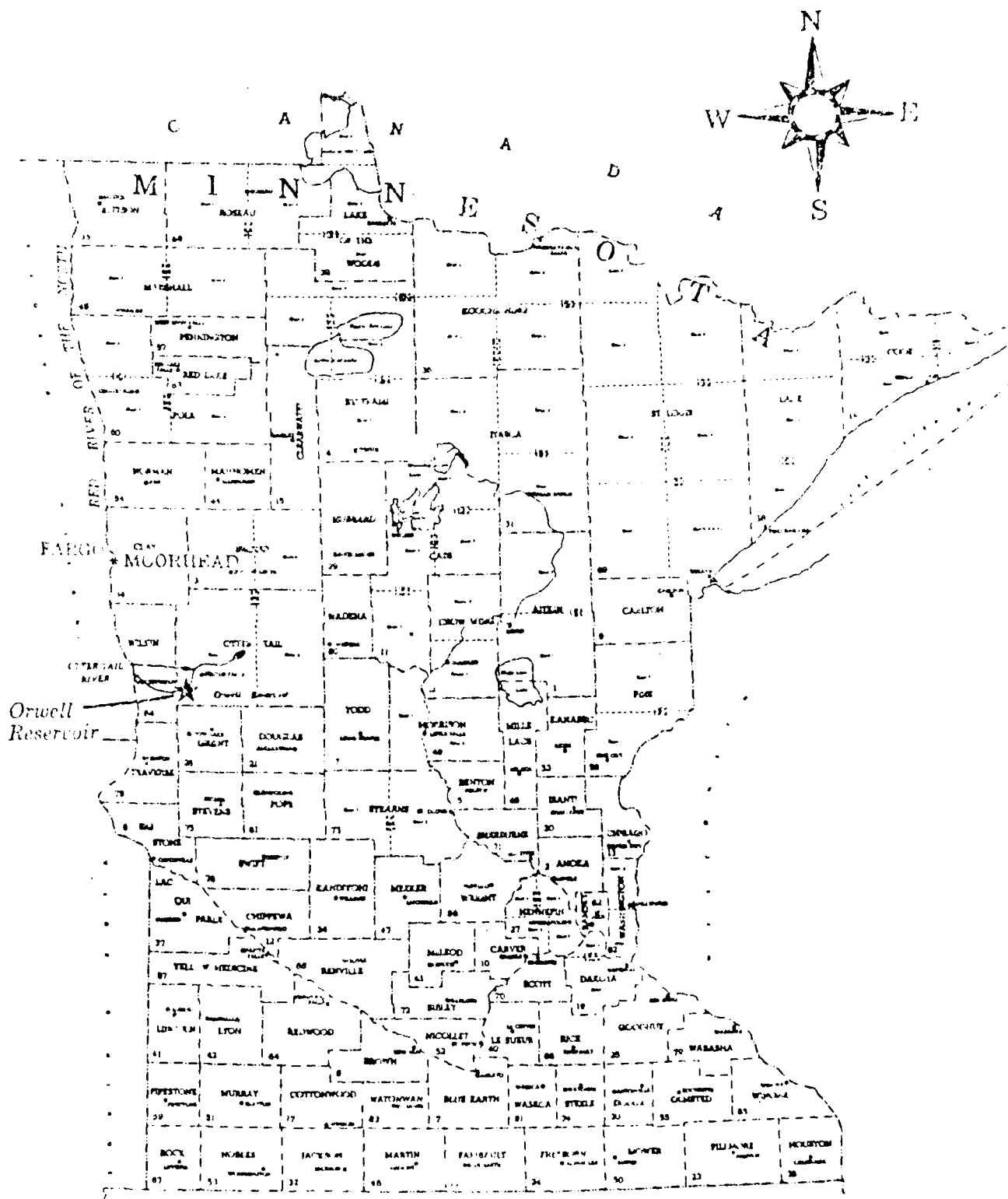


Figure 1

report is available for inspection in the District Office and will be made available to the contractor during the contract period.

3.00 DEFINITIONS

3.01 For the purpose of this study, the cultural resources investigation will involve a Phase I survey in specified areas of the Orwell Reservoir project area.

3.02 "Cultural resources" are defined to include any building, site, district, structure, object, data, or other material relating to the history, architecture, archaeology, or culture of an area.

3.03 "Phase I cultural resources survey" is defined as an intensive, on-the-ground survey and testing of an area sufficient to determine the number and extent of the resources present and their relationship to project features. A Phase I cultural resources survey will result in data adequate to assess the general nature of the sites present; a recommendation for additional testing of those resources which, in the professional opinion of the Contractor, may provide important cultural and scientific information; and detailed time and cost estimates for Phase II testing.

3.04 "Phase II testing" is defined as the intensive testing of those sites that may provide important cultural and scientific information. Phase II testing will result in data adequate to determine the eligibility of the resources for inclusion on the National Register of Historic Places, a plan for the satisfactory mitigation of eligible sites that will be directly or indirectly impacted, and detailed time and cost estimates for mitigation.

4.00 SURVEY AND TESTING SPECIFICATIONS

4.01 A Phase I cultural resources survey shall be conducted at Orwell Reservoir in areas which are severely eroding. The faces of these banks will be examined for evidence of eroding cultural material. In addition, a cultural resources survey will be conducted from the top of all eroding banks to a point 150 feet back from the bank. This survey will be conducted to determine the presence of resources which may be impacted from any required bank shaping.

4.02 Bank heights vary from 2.5 meters to 6.0 meters and bank lengths vary from 28.96 meters to 247.32 meters. Figure 3 and table 1 show the locations of the erosion stations (as provided in the report discussed in section 2.05 above) and given the bank lengths, station bank heights, and average bank height, respectively.

4.03 The bank locations provided in figure 3 are those banks where erosion stations were established during the University of North Dakota's study effort. Additional eroding shoreline, which also requires survey, may be located in the project area. It is suggested that bidders either visit the

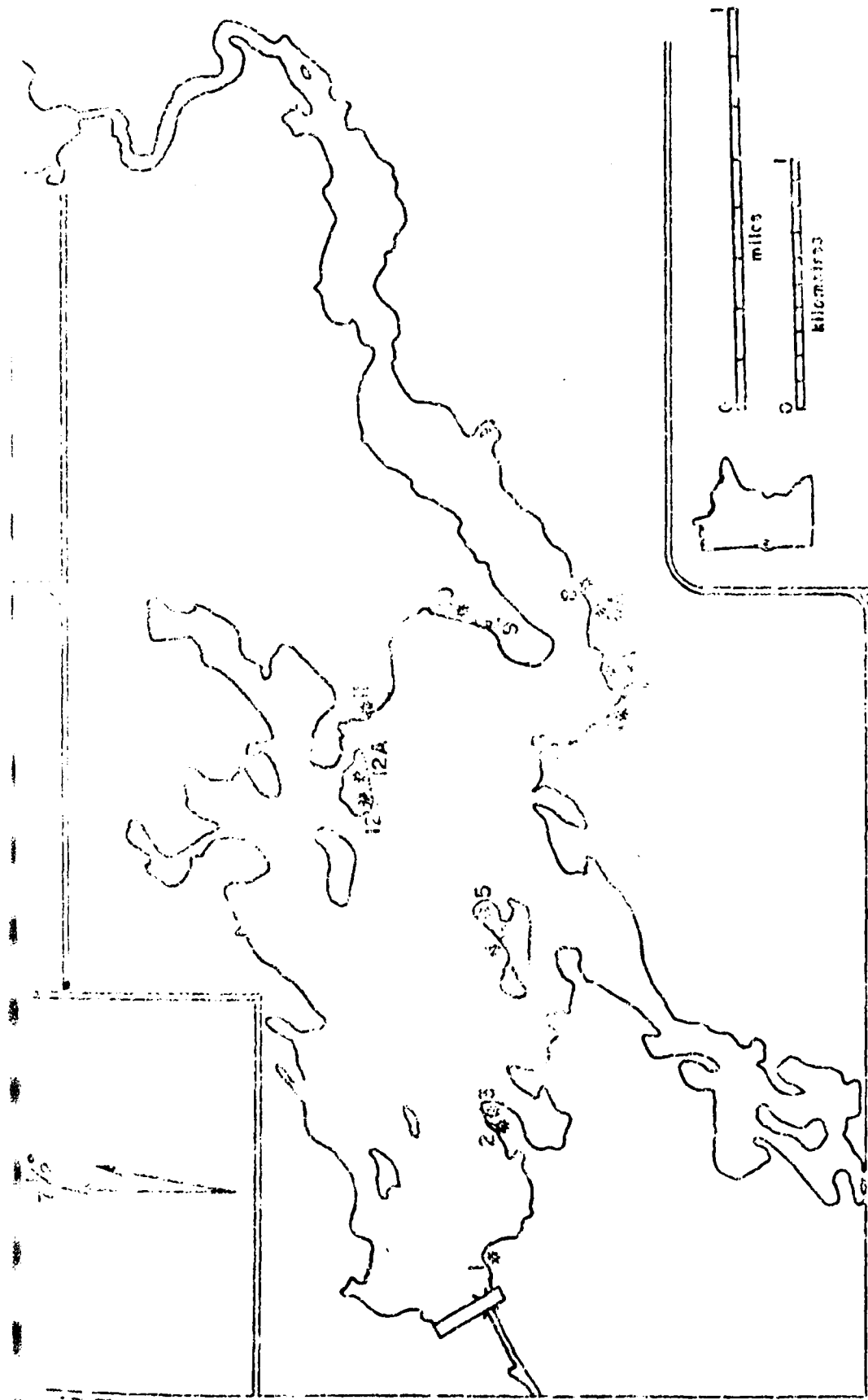


Figure 3. Orwell Lake, MN., with locations of erosion stations.

Table 1

Section	Location	Length (m)	Station Bank Height (m)	Average Bank Height (m)
1	ES #1	82.30	3.2	2
2	ES #2,3	163.06	2.5, 3.4	2
3	E. of #3	70.10	-	1
4	W. of #4	45.72	-	1.5
5	ES #4,5	247.32	3.5, 3.5	2.9
6	ES #6	156.97	6	3
7	W. of #7	28.96	-	3.5
8	W. of #7	53.34	-	3
9	ES #7	38.10	3.6	1.75
10	W. of #8	97.54	3.2	3.2
11	ES #8	51.82	4	4
12	ES #9	105.00	3.3	5
13	ES #10	79.80	3.4	3
14	ES #11	141.73	3.1	2
15	E. of #12	33.53	-	1.2
16	ES #12	195.07 T=1590.36	3.5	2.8

project area to assess total survey needs or inspect a set of aerial photographs in the St. Paul District Office prior to submitting a bid.

4.04 Survey efforts shall not proceed to the level of a Phase II survey as defined in section 3.04 above.

4.05 The contractor shall also relocate and assess the condition of the 7 burial mounds recorded as field site number 03.0 during the 1981 survey. The site was originally described as being located on a lowland mud flat adjacent to the present Otter Tail River, with annual flooding causing soil redeposition over the entire mud flat.

5.00 PERFORMANCE SPECIFICATIONS

5.01 The Contractor will use a systematic, interdisciplinary approach in conducting the study. The Contractor will provide specialized knowledge and skills during the course of the study to include expertise in archaeology and in other social and natural sciences as required.

5.02 The extent and character of the work to be conducted by the Contractor will be subject to the general supervision, direction, control, review, and approval of the Contracting Officer.

5.03 Techniques and methodologies that the Contractor uses during the investigation shall be representative of the current state of knowledge for their respective disciplines.

5.04 The Contractor must keep standard records that shall include, but not be limited to, field notebooks, site survey forms, field maps, and photographs.

5.05 The recommended professional treatment of recovered materials is curation and storage of the artifacts at an institution that can properly insure their preservation and that will make them available for research and public view. If such materials are not in Federal ownership, the consent of the owner must be obtained, in accordance with applicable law, concerning the disposition of the materials after completion of the report. The Contractor will be responsible for making curatorial arrangements for any collections that are obtained. Such arrangements must be coordinated with the appropriate officials of Minnesota and approved by the Contracting Officer.

5.06 When sites are not wholly contained within the project limits, the Contractor shall survey an area outside the project limits large enough to include the entire site within the survey area. This procedure shall be done in an effort to delineate site boundaries and to determine the degree to which the site will be impacted.

5.07 The Contractor shall provide all materials and equipment as may be necessary to expeditiously perform those services required of the study.

5.08 Should it become necessary in the performance of the work and services, the Contractor shall, at no cost to the Government, secure the rights of ingress and egress on properties not owned or controlled by the Government. The Contractor shall secure the consent of the owner, his representative, or agent, in writing prior to effecting entry on such property. If requested, a letter of introduction, signed by the District Engineer, can be provided to explain the project purposes and request the cooperation of landowners. When a landowner denies permission for survey, the Contractor shall immediately notify the Contracting Officer and shall describe the extent of the property to be excluded from the survey.

5.09 The Contractor will test the site areas sufficiently to determine the existence of cultural materials and/or features, their condition (in situ or disturbed), the horizontal and vertical distribution of the remains, and, if possible, the cultural affiliation of the site(s).

5.10 The on-the-ground examination will involve an intensive survey and shovel testing of the area to determine the number and extent of cultural resources present. This includes standing structures as well as historical and prehistorical archaeological sites.

5.11 The Contractor's survey will include surface inspection in areas where surface visibility permits adequate recovery of cultural materials and subsurface testing in all areas where surface visibility is limited or obscured. Subsurface investigation may include shovel testing, coring, soil borings, cut bank profiling or some other testing method, as appropriate. If field methods vary from those required, they must be described and justified in the report.

5.12 The required survey grid or transect interval is 15 meters (50 feet) and testing interval is 15 meters (50 feet). However, this interval may vary depending upon field conditions. If the recommended interval is not used, written justification should be presented in the technical report for selection of an alternate interval. All subsurface tests will be screened through 1/4-inch mesh hardware cloth and will be recorded on appropriate testing forms. All subsurface testing forms will be included in the appendix to the Contractor's report. The Contractor will also indicate the locations of all subsurface tests on USGS and/or project maps and key these with the testing forms in the appendix.

5.13 The tested areas will be returned as closely as practical to pre-survey conditions by the Contractor.

6.00 GENERAL REPORT REQUIREMENTS

6.01 The Contractor will submit the following types of reports, which are described in this section and in section 9.00: field report, field notes, draft contract report, and final contract report.

6.02 The Contractor's technical report will include, but will not be limited to, the following sections, as appropriate to the study.

a. Title Page: The title page will provide the following information: the type of investigation undertaken; the cultural resources that were assessed (archaeological, historical, and architectural); the project name and location (county and State); the date of the report; the Contractor's name; the contract number; the name of the author(s) and/or Principal Investigator; the signature of the Principal Investigator; and the agency for which the report is being prepared.

b. Management Summary: This section will include a concise summary of the study, which will contain all essential data for using the document in the Corps of Engineers management of the project. This information will minimally include: summary of the study (field work; lab analysis), study limitations, study results, significance, recommendations, and the repository of all pertinent records and artifacts.

c. Table of Contents

d. List of Figures

e. List of Plates

f. Introduction: This section will identify the sponsor (Corps of Engineers) and the sponsor's reason for the study; an overview of the testing and survey project, with the site(s) located on USGS quad maps. This section will also provide an overview of the cultural resource study to be undertaken; define the location and boundaries of the study areas (with regional and area-specific maps); define the study area within its cultural, regional, and environmental context; reference the scope of work; identify the institute that did the work, the number of people involved in the study, and the number of person-days/hours spent on the study; identify the dates when the various types of work were completed; identify the repository of records and artifacts; and provide a brief overview or outline of how the study report will proceed and an overview of the major goals that the study/study report will accomplish.

g. Previous Archaeological and Historical Studies: This section will provide a brief summary and evaluation of previous archaeological and historical studies of the study area including the researchers, date, extent, adequacy of the past work, study results, and cultural/behavioral inferences derived from the research.

h. Environmental Background: This section will include a brief description of the study area environment, such as geology, vegetation, fauna, climate, topography, physiography, and soils, with reference to prehistoric, historic, ethnographic, and contemporary periods. Any information available on the relationship of the environmental setting to the area's prehistory and history will also be included. This section will be of a length commensurate with other report sections.

i. Theoretical and Methodological Overview: This section will include a description or statement of the goals of the Corps of Engineers and the study researcher, the theoretical and methodological orientation of the study, and the research strategies that were applied in achieving the stated goals.

j. Field Methods: This section will describe the specific archaeological activities undertaken to achieve the stated theoretical and methodological goals. The section will include all field methods, techniques, strategies, and rationale or justification for specific methods or decisions. The description of the field methods will minimally include: a description of field conditions, topographic/physiographic features, vegetation conditions, soil types, stratigraphy, testing results with all appropriate testing forms to be included as an appendix, and the rationale for eliminating uninvestigated areas. Testing methods will include descriptions of test units (size, intervals, stratigraphy, depth) and the rationale behind their placement.

k. Laboratory Methods: This section should explain in detail the laboratory methods employed and the rationale behind the method selected. This section should also contain references to accession numbers used for all collections, photographs and field notes obtained during the study, and the location where they are permanently housed.

l. Analysis: This section will describe and provide the rationale for the specific analytic methods and techniques used, and describe and discuss the qualitative and quantitative manipulation of the data. Limitations or problems with the analysis based on the data collection results will also be discussed. This section will also contain references to accession numbers used for all collections, photographs, and field notes obtained during the study, and the location where they are permanently housed.

m. Investigation Results: This section will describe all the archaeological resources encountered during the study, and other data pertinent to a complete understanding of the resources within the study area. This section will include enough empirical data that the study results can be independently assessed. The description of the data will minimally include: a description of the site; amounts and type of material remains recovered; relation of the site or sites to physiographic features, vegetation and soil types; direct and indirect impacts to the site(s); analysis of the site and data (e.g., site type, cultural historical components and information, cultural/behavioral inferences or patterns); site condition; and location and size information (elevation, complete quad map source, legal description, address if appropriate, and site size, density, depth, and extent).

n. Evaluation and Conclusions: This section will evaluate and formulate conclusions concerning location of the site(s); size, condition, distribution, and density in relation to other sites in the area; and significance in relation to the local and regional prehistory, protohistory, and history. This section will also discuss the potential and goals for future research; the reliability of the analysis; relate results of the study and analysis to

the stated study goals; identify changes, if any, in the research goals; synthesize and compare the results of the analysis and study; integrate ancillary data; and identify and discuss cultural/behavioral patterns and processes that are inferred from the study and analysis results.

o. Recommendations: This section will discuss the significance of the site(s) in relation to the research goals of the study recommend future Phase II testing priorities and needs, as appropriate; and make suggestions with regard to the Corps of Engineers planning goals. These recommendations will include a time and cost estimate for Phase II testing, if necessary. If it is the Contractor's assessment that the site(s) is (are) or is not significant, the methods of investigation and reasoning which support that conclusion will be presented. Any evidence of cultural resources or materials which have been previously disturbed or destroyed will be presented and explained. If certain areas are not accessible, recommendations will be made for future consideration.

p. References: This section will provide standard bibliographic references (American Antiquity format) for every publication cited in the report. References not cited in the report will be listed in a separate "Additional References" section.

q. Appendix: This section will include the Scope of Work, resumes of key personnel involved, all correspondence derived from the study, all State site forms, and all testing and any other pertinent report information referenced in the text as being included in the appendix.

6.03 The location of all sites, areas surveyed, and other features discussed in the text will be shown on legibly photocopied USGS maps and will be bound into the report. All maps will be labeled with a caption/description, a north arrow, a scale bar, township, range, map size, and dates, and the map source (e.g., the USGS quad name or published source) and will have proper margins.

6.04 All sites identified in the course of the study, including find spots and known sites, will be presented on State site forms as an appendix to the report. Data should also be provided about the present condition of the sites (disturbance by natural or manmade processes) and content of any collections from the sites. Known sites all have their State site forms updated as necessary. All State site forms will be submitted to the State Archaeologist.

6.05 Failure to fulfill these report requirements will result in the rejection of the Contractor's report by the Contracting Officer.

7.00 FORMAT SPECIFICATIONS

7.01 The Contractor shall submit to the Contracting Officer the photographic negatives for all black and white photographs that appear in the final report.

7.02 All text materials will be typed, single-spaced (the draft reports should be space-and-one-half or double-spaced), on good quality bond paper,

8.5 inches by 11.0 inches with 1.5-inch binding and bottom margins and 1-inch margins on the top and other margin, and will be printed on both sides of the paper.

7.03 Information will be presented in textual, tabular, and graphic forms, whichever are most appropriate, effective, or advantageous to communicate the necessary information.

7.04 All figures and maps must be clear, legible, self-explanatory, and of sufficiently high quality to be readily reproducible by standard xerographic equipment, and will have margins as defined above.

7.05 The final report cover letter shall include a budget of the project.

7.06 The draft and final reports will be divided into easily discernible chapters, with appropriate page separation and heading.

8.00 MATERIALS PROVIDED

8.01 The Contracting Officer will furnish the Contractor with the following materials: access to any publications, records, maps, or photographs that are on file at the district headquarters.

9.00 SUBMITTALS

9.01 The Contractor will submit reports according to the following schedules:

a. Field Report: The original and one copy of a field report will be submitted after completion of the field work. The field report will summarize the work, project/field limitations, methodology used, time used, and survey results.

b. Project Field Notes: One legible copy of all the project field notes will be submitted with the draft contract report.

c. Draft Contract Report: Seven (7) copies of the draft contract report will be submitted on or before 1 September 1985. The draft contract report will be reviewed by the Corps of Engineers, the State Historic Preservation Officer, the State Archaeologist, and the National Park Service. The draft contract report will be submitted according to the report and contract specifications outlined in this Scope of Work.

d. Final Contract Report: The original and 15 copies of the final contract report will be submitted 60 days after the Corps of Engineers comments on the draft contract report are received by the Contractor. The final contract report will incorporate all the comments made on the draft contract report.

9.02 Neither the Contractor nor his representative shall release any sketch, photograph, report, or other material of any nature obtained or prepared under

the contract without specific written approval of the Contracting Officer prior to the acceptance of the final report by the Government.

9.03 All materials, documents, collections, notes, forms, maps, etc., which have been produced, gathered, or acquired in any manner for use in the completion of this contract shall be made available to the Contracting Officer upon request.

10.00 METHOD OF PAYMENT

10.01 Requests for partial payment under this fixed price contract shall be made monthly on ENG Form 93. A 10-percent retained percentage will be withheld from each partial payment. Upon approval of the final reports by the Contracting Officer, final payment, including previously retained percentage, shall be made.

APPENDIX D: PERSONEL VITAE

VITA

PERSONAL DATA

Name: Richard Alan Strachan Birthdate: October 11, 1946
Marital Status: Married Telephone: 507-243-3340
Children: Terry(6) and Tisha(4)

Address: Rural Route 2, Box 110
Madison Lake, Minnesota 56063

EDUCATION

Ph.D. in Anthropology from Wayne State University, 1973.
M.A. in Anthropology from Wayne State University, 1969.
B.A. in History from Wayne State University, 1968.

CURRENT POSITION

Professor (Tenured), Mankato State University.
Chairman, Department of Anthropology
Director, Mankato State University Museum of Anthropology.

TEACHING EXPERIENCE

Professor, Mankato State University (1980 - Present).
Associate Professor, Mankato State University (1975 - 1980).
Assistant Professor, Mankato State University (1971-1975).
Instructor, Department of Sociology and Anthropology,
University of Windsor (1969 - 1971).
Instructor (Adjunct), Social Science Program, Wayne State
University (1969 - 1970).

AREAS OF INTEREST

Eastern North American Prehistory, Minnesota Prehistory,
Theory, Statistics, Computers, Museology.

COURSES TAUGHT

Introduction to Social Science, Introduction to Anthro-
pology, Cultural Anthropology, Archaeology, Anthro-
pology, Archaeology, Physical Anthropology, Anthro-
history, South American Prehistory, Meso American
Latin American Prehistory, North American Prehistory,
Egypt, Minnesota Prehistory, Archaeology.

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A CULTURAL RESOURCE SURVEY AT ORWELL RESERVOIR OTTER
TAIL COUNTY MINNESOTA (U) IMPACT SERVICES INC HANKATO MN
R A STRACHAN ET AL. JUL 86 DACW37-85-M-1841

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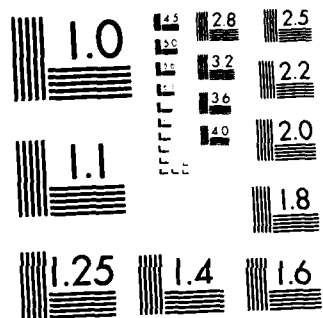
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

pological Theory, Archaeological Field School, Statistics, Computers Museums and Archaeology, Museology, Language and the Human Condition

FIELD EXPERIENCE

Principal Investigator: Archaeological Excavations in Nicollet County Minnesota, Summer 1986.

Principal Investigator: An Archaeological Survey at Lake Orwell, Ottertail County Minnesota, Fall 1986

Principal Investigator: Archaeological Survey at the Fairmont Rehabilitation Center, Martin County Minnesota. Spring 1985.

Principal Investigator: Archaeological Survey in LeSeuer County Minnesota. Spring 1985.

Principal Investigator: Archaeological Survey at the Minneopa Interpretative Center in Blue Earth County Minnesota. Fall 1984.

Principal Investigator: Archaeological Survey in Northeastern Blue Earth County. Fall 1984

Principal Investigator: Site Survey in Nicollet County, Minnesota. Summer 1984.

Consultant: Mitigation of Archaeological Sites at Saylorville Lake, Iowa. Principal Investigator: Patricia M. Emerson. Summer 1983/Summer 1984.

Consultant: Resurvey and Intensive Testing at Saylorville Lake, Iowa. Principal Investigator: Patricia M. Emerson. Summer/Winter 1982.

Principal Investigator: Site Survey of Middle Lake and Swan Lake, Nicollet County, Minnesota. Summer 1982.

Principal Investigator: Archaeological Reconnaissance Survey of Iowa-Illinois Gas & Electric Co. Transmission Circuits and Substations, Muscatine, Louisa and Washington Counties, Iowa. With Kathleen A. Roetzel. Summer 1980.

Principal Investigator: Cultural Resources Survey of the Henderson Station County Park, LeSueur County, Minnesota. Summer 1980.

Principal Investigator: Cultural Resource Survey of McDonald's Park, McLeod County, Minnesota. Summer 1980.

Consultant: Archaeological Survey and Site Testing at Maquoketa Caves State Park, Jackson County, Iowa. Spring-Summer 1980.

Principal Investigator: Archaeological Reconnaissance Survey of the Stormwater Diversion and Treatment System Project, Waseca County, Minnesota. With Kathleen A. Roetzel. Summer 1979.

Consultant: Archaeological Site Survey and Testing of Harlan County Lake, Republican River, Nebraska. Principal Investigator: Kathleen A. Roetzel. Summer 1979.

Principal Investigator: Archaeological Investigation of the Proposed Lagoon Site, Dam Site Recreation Area, Coralville Lake, Iowa. With Kathleen A. Roetzel. Summer 1979.

Principal Investigator: Archaeological Reconnaissance Survey near Zumbro Falls, Wabasha County, Minnesota. Spring 1979.

Principal Investigator: Archaeological Reconnaissance Survey of Blue Earth City Park, Faribault County, Minnesota. Spring 1979.

Principal Investigator: Site Survey of Kansas Lake Park, Watonwan County, Minnesota. Spring 1979.

Principal Investigator: Site Survey of the Stanton and Preferred Corridors, North and South Dakota. Summer/Fall 1978.

Principal Investigator: Archaeological Excavation of the Eleanor Site (21NL30), Nicollet County, Minnesota. Summer 1978.

Principal Investigator: Site Survey for the Southwestern Minnesota Cooperative Electric, Rock County, Minnesota. Summer 1978.

Principal Investigator: Site Survey at Camden State Park, Lyons County, Minnesota. Summer 1978.

Consultant: Site Survey of the Bureau of Reclamation Irrigation Project Near Pollock and Herreid, Campbell County, South Dakota. Principal Investigators: Kathleen A. Roetzel and Nancy L. Woolworth. Summer 1978.

Principal Investigator: Site Survey of LeSueur County Park near Lake Washington, LeSueur County, Minnesota. Summer 1978.

Principal Investigator: Site Survey at Garvin Park, Lyons County, Minnesota. Fall 1977.

Principal Investigator: Archaeological Excavation of the Eleanor Site (21NL30), Nicollet County, Minnesota. With Kathleen A. Roetzel. Summer 1977.

Principal Investigator: Site Survey at Camden State Park, Lyons County, Minnesota. Spring 1977.

Principal Investigator: Archaeological Site Survey of the Eleanor Site (21NL30), Nicollet County, Minnesota. With Kathleen A. Roetzel. Spring 1977.

Principal Investigator: Site Survey of Swan Lake Perimeter, Nicollet County, Minnesota. With Kathleen A. Roetzel. Fall 1976.

Principal Investigator: Aerial Site Survey of Lake Ashtabula, Barnes County, North Dakota. With Kathleen A. Roetzel. Summer 1976.

Salvage Excavation of the Silvernale Site, Goodhue County, Minnesota. Principal Investigator: Christina Harrison. Spring/Fall 1976.

Principal Investigator: Site Survey of the Swan Lake Perimeter, Nicollet County, Minnesota. Fall 1975.

Principal Investigator: Site Survey of the Rochester Flood Control Area, Olmsted County, Minnesota. Fall 1975.

Principal Investigator: Excavation of the Mankato Site, Blue Earth County, Minnesota. Summer 1974.

Principal Investigator: Excavation of the Bauer Site, LeSueur County, Minnesota. Summer/Fall 1972.

Principal Investigator: Site Survey of Blue Earth and Surrounding Minnesota Counties. 1971-1972.

Principal Investigator: Salvage Excavation of the DeClerk Site, Macomb County, Michigan. Summer 1970.

Principal Investigator: Excavation of the Cady Site, Macomb County, Michigan. With Gordon L. Grosscup. 1970.

Excavation of the Moross House, Wayne County, Michigan. Principal Investigator: Gordon L. Grosscup. Fall 1969.

Excavation of the Heidenreich Site, Macomb County, Michigan. Principal Investigator: Gordon L. Grosscup. Fall 1968.

REPORTS AND PUBLICATIONS

An Archaeological Survey at the Fairmont Rehabilitation Center, Martin County Minnesota May 1985.

An Archaeological Survey at the Minneopa Interpretative Center, Blue Earth County Minnesota. February 1985

Intensive Archaeological Reconnaissance and Site Testing for the National Register of Historic Places, Harlan County, Nebraska. Volumes I-II. With Kathleen A. Roetzel, Patricia M. Emerson and Wanda A. Watson. February 1981.

An Archaeological, Architectural-Historical and Geomorphological Survey at Maquoketa Caves State Park, Jackson County, Iowa. Volumes I-III. With Kathleen A. Roetzel, Michael A. Eigen, Robert Douglas and Patricia M. Emerson. July 1980.

Archaeological Reconnaissance Survey of the Louisa Transmission Circuits 345-56-93-H-1 and 345-93-H-T-1 and Substations T and 92, Muscatine, Louisa and Washington Counties, Iowa. With Kathleen A. Roetzel. Summer 1980.

The Cultural Resource Survey of McDonald's Park near Hutchinson, McLeod County, Minnesota. Summer 1980.

The Cultural Resources Survey of the Henderson Station County Park, LeSueur County, Minnesota. Summer 1980.

The Archaeological Reconnaissance Survey Near Zumbro Falls, Wabasha County, Minnesota. Spring 1979.

The Archaeological Reconnaissance Survey of Blue Earth City Park, Faribault County, Minnesota. Spring 1979.

An Archaeological Survey of Lake Washington County Park, LeSueur County, Minnesota. Summer 1978.

An Archaeological Survey in Rock County, Minnesota. Summer 1978.

An Archaeological Survey at Garvin Park, Lyons County, Minnesota. Summer 1978.

Archaeological Survey of Woods Lake Park, Faribault County, Minnesota. Fall 1976.

Aerial Infrared Survey of Lake Ashtabula, North Dakota. With Kathleen A. Roetzel. Fall 1976.

Archaeological Survey of Rochester Flood Control Area. Fall 1975.

Archaeological Survey of Mankato Flood Control Area. With Kathleen A. Roetzel. Fall 1975.

The Cady Site: A Methodological and Statistical Analysis of a Multi-Component Archaeological Site. Ph.D. Dissertation. August 1973.

A Review of Africa, 1969-1970, by Editorial Staff of "Jeune Afrique", in African Studies Review (Formerly African Studies Bulletin), Vol. 13, No. 1, 1970.

PAPERS AND MANUSCRIPTS

Computerizing the Archaeological Laboratory. Paper presented at the Spring Meeting of the Council for Minnesota Archaeology. 1986

Laboratory Computer Cataloging Systems. Paper presented at the Fall Meeting of the Council for Minnesota Archaeology. 1985

Rodent Burrow Stratigraphy and Burial Mounds. Paper presented at the Spring Meeting of the Council for Minnesota Archaeology. 1985.

Excavations at the Eleanor Site (21NL30): New Methods and Approaches. Paper presented at the Spring Meeting of the Council for Minnesota Archaeology. 1978.

Computerized Bibliography of Minnesota Archaeology. Manuscript Form. 1978.

Thermal Alteration of Oolitic Chert. In "Lithic Technology Symposium" at the Joint Plains Anthropology Conference - Midwest Archaeological Society Annual Meetings. Minneapolis, Minnesota. October 1976.

Lithic Technologies in Minnesota. With Wanda Watson and Jerry Kaufman. Paper presented at the Annual Meetings of the Minnesota Academy of Science. Mankato, Minnesota. May 1975.

Projectile Point Taxonomy - A Different Approach. Paper presented at the Annual Meetings of the Central States Anthropological Society. Chicago, Illinois. March 1974.

Archaeology at the Bauer Site. With Robert Burgess. Paper presented at the Annual Meetings of the Minnesota Academy of Science. Northfield, Minnesota. May 1973.

Lessons from the Past. Keynote Address at the Minnesota Junior Academy of Science, Annual Meeting. St. Paul, Minnesota. November, 1972.

Preliminary Analysis of the Horse Thief Island Site. Paper presented at the Annual Meetings of the Minnesota Academy of Science. Marshall, Minnesota. May 1972.

The Codification of Artifacts - To Compute or Not To Compute. Paper presented at the Annual Meetings of the Central State Anthropological Society. Cleveland, Ohio. April 1972.

The Computer in Historic Archaeology: A Preliminary Analysis of the Moross House Site. With Karen D. Kovac. Paper presented at the Annual Meetings of the American Anthropological Association. New York, New York. November 1971.

Profile Analysis in the Interpretation of Archaeological Data. Paper presented at the Annual Meeting of the Society for American Archaeology. Norman, Oklahoma. May 1971.

A Kinship Simulation: A Functioning Model of a Functioning System. Paper presented at the Annual Meetings of the Central States Anthropological Society. Detroit, Michigan. April 1971.

Excavations at Cady Corners: A Preliminary Report. Paper presented at the Clinton Valley Chapter of the Michigan Archaeological Society. Southfield, Michigan. March 1971.

The Nupur: An African Peasant Society Since the Fifteenth Century. Paper presented at the Annual Meetings of the Central State Anthropological Society. Bloomington, Indiana. April 1970.

Simulation Applications in Anthropology. With Zelda Klapper. Paper presented at the Annual Meetings of the Central State Anthropological Society. Bloomington, Indiana. April 1970.

SCHOLARLY ACTIVITIES

President, Council for Minnesota Archaeology (1984-1986).

Consultanting Archaeologist, Impact Services, Inc. (1978 - present).

Coordinator, State Archaeologist Office - Southern Minnesota Regional Center at Mankato State University Museum of Anthropology. 1983 - present.

Session Chairman, Spring Paper Session - Council for Minnesota Archaeology. 1984.

Session Chairman, Fall Paper Session - Council for Minnesota Archaeology. 1984.

Organizer and Local Arrangements Co-Chairman, Symposium on "Current Directions in Upper Midwestern Prehistory", Mankato State University, May 1980.

President, Council for Minnesota Archaeology (1977-1979).

Consultant, Southwest District, Minnesota Department of Natural Resources (1977-1979).

Consultant, Southeast District, Minnesota Department of Natural Resources (1977-1979).

Project Consultant, Cultural Resources Inventory of Chippewa National Forest. 1979.

Project Consultant, Site Survey of the Bureau of Reclamation Irrigation Project Near Pollock and Herreid, Campbell County, South Dakota. 1978.

Local Arrangements Chairman, 1976 Joint Meetings of the Plains Anthropological Conference - Midwest Archaeological Society. Minneapolis, Minnesota. October 1976.

Session Chairman, "Methodological Approaches", at the 1976 Joint Meetings of the Plains Anthropological Conference - Midwest Archaeological Society. Minneapolis, Minnesota. October 1976.

Vice-President, Council for Minnesota Archaeology (1975-1977).

Chairman, Ethics and Membership Committee. Council for Minnesota Archaeology. 1976.

Acting Chairman, Council for Minnesota Archaeology. 1976.

Chairman, Archaeological Survey Standards Committee. Council for Minnesota Archaeology. 1976.

Anthropology Section Chairman, 1974 Meetings of the Minnesota Academy of Science. St. Paul, Minnesota. May 1974.

RECENT COMMUNITY ACTIVITIES

Developed Museum Display at the Nicollet County Museum, St. Peter Minnesota. Spring 1985.

Presentation entitled "Archaeology in the United States" for the All Saints grade School Madison Lake Minnesota. Fall 1984.

Presentation entitled "Archaeology in the Swan Lake Area" for the Nicollet County Historical Society. Summer 1984.

Presentation entitled "Archaeology" for fifth grade at the Cleveland Grade school Cleveland Minnesota. Spring 1984

Lecture entitled "Archaeology in Nicollet County" for the St. Peter Arts and Heritage Council. Spring 1983.

GRANTS AND AWARDS

Sabbatical Leave, Mankato State University. Spring Quarter 1979.

Faculty Improvement Grant, Mankato State University, for Completion and Analysis of Artifactual Material from the Cady Site. Summer 1972.

Faculty Research Grant, Mankato State University. Entitled "Excavation and Analysis of the Bauer Site". Summer 1972.

Faculty Research Grant, Mankato State University. Entitled "An Archaeological Site Survey of Selected Southern Minnesota Counties". 1971-1972.

Computer Research Grant, Department of Anthropology, Wayne State University. Computer Time for Integrated Analysis During the Excavation of the Cady Site. 1970-1971.

National Science Foundation Summer Traineeship. Summer 1970.

University Graduate Fellowship, Wayne State University. 1969-1970.

University Professional Scholarship, Wayne State University. 1968-1969.

PROFESSIONAL MEMBERSHIPS

Society for American Archaeology, Council for Minnesota Archaeology, Blue Earth County Historical Society

REFERENCES

Christy A. H.Caine, Minnesota State Archaeologist, State Archaeologist's Office, c/o Dept. of Anthropology, Hamline University, St. Paul, Minnesota 55104

William Webster, Dean, College of Social and Behavioral Sciences, Mankato State University, Mankato, Minnesota 56001

Gordon L. Grosscup, Professor of Anthropology, Dept. of Anthropology, Wayne State University, Detroit, Michigan

VITA

PERSONAL DATA

Name: Kathleen Ann Roetzel Birthdate: June 19, 1951
Marital Status: Married Telephone: 507-243-3340
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 Madison Lake, Minnesota 56063

EDUCATION

Post Graduate Work (Anthropology/Archaeology), Ohio State University and the University of Minnesota. 1974, 1975.

M.A. in Anthropology/Archaeology from Ohio State University, 1974.

B.A. in Sociology from Mankato State University, 1973.

A.A. (General) from Rochester Community College, 1971.

CURRENT POSITION

Prehistoric Archaeologist and President, Impact Services, Inc.

Adjunct Faculty, Mankato State University, 1976-Present.

FIELD EXPERIENCE

Participant: Archaeological Survey at the Fairmont Rehabilitation Center, Martin County Minnesota. Spring 1985.

Participant: Archaeological Survey in LeSeuer County Minnesota. Spring 1985.

Participant: Archaeological Survey in Northeastern Blue Earth County. Fall 1984

Participant: Site Survey in Nicollet County, Minnesota. Summer 1984.

Consultant: Mitigation of Archaeological Sites at Saylorville Lake, Iowa. Principal Investigator: Patricia M. Emerson. Summer 1983/Summer 1984.

Consultant: Resurvey and Intensive Testing at Saylorville Lake, Ia. Principal Investigator: Patricia M. Emerson. Summer/Winter 1982.

Principal Investigator: Cultural Resource Survey of Cannon River Park, LeSueur County, Minnesota. Winter 1981.

Principal Investigator: Cultural Resource Survey of Stoney Point Park, Lincoln County, Minnesota. Winter 1981.

Principal Investigator: Cultural Resource Survey of Rasmussen Woods/Indian Creek Slough, Blue Earth County, Minnesota. Fall 1980.

Principal Investigator: Cultural Resource Survey of the Kasota Access, LeSueur County, Minnesota. Summer 1980.

Principal Investigator: Archaeological Reconnaissance Survey of Iowa-Illinois Gas & Electric Co. Transmission Circuits and Substations, Muscatine, Louisa and Washington Counties, Iowa. Summer 1980.

Co-Principal Investigator: Cultural Resources Survey of the Henderson Station County Park, LeSueur County, Minnesota. Summer 1980.

Principal Investigator: Cultural Resources Survey of the Proposed Underground Transmission Lines, Lac Qui Parle, Yellow Medicine and Chippewa Counties, Minnesota. Summer 1980.

Principal Investigator: Cultural Resource Survey of Proposed Channel Realignment Area at Big Stone-Whetstone Flood Control Project, Big Stone and Lac Qui Parle Counties, Minnesota. Summer 1980.

Principal Investigator: Cultural Resource Survey of McDonald's Park, McLeod County, Minnesota. Summer 1980.

Principal Investigator: Cultural Resource Survey of Clear Lake Park, Jackson County, Minnesota. Summer 1980.

Principal Investigator: Archaeological Survey and Site Testing at Maquoketa Caves State Park, Jackson County, Iowa. Spring-Summer 1980.

Principal Investigator: Cultural Resources Survey of the Depot Riverside Park, Goodhue County, Minnesota. Spring 1980.

Principal Investigator: Cultural Resources Survey of the Proposed Wildwood County Park, Blue Earth County, Minnesota. Spring 1980.

Principal Investigator: Cultural Resources Survey of Wastewater Treatment Facilities at Morton, Renville County, Minnesota. Winter 1979/1980.

Principal Investigator: Cultural Resource Survey of New Ulm Airport Expansion Project, Brown County, Minnesota. Winter 1979/1980.

Principal Investigator: Cultural Resource Survey of Wild Rice River-South Branch and Felton Ditch Flood Control Project Area, Clay and Norman Counties, Minnesota. Fall 1979.

Principal Investigator: Inventory of the Historic and Prehistoric Cultural Resources of the Chippewa National Forest. Fall 1979.

Principal Investigator: Archaeological Investigation of the Proposed Lagoon Site, Dam Site Recreation Area, Coralville Lake, Iowa. Summer 1979.

Principal Investigator: Archaeological Site Survey and Testing of Harlan County Lake, Republican River, Nebraska. Summer 1979.

Principal Investigator: Archaeological Reconnaissance Survey of the Stormwater Diversion and Treatment System Project, Waseca County, Minnesota. Summer 1979.

Principal Investigator: Site Survey at Lakeview City Park, Waseca County, Minnesota. Summer 1979.

Field Supervisor: Site Survey at Blue Earth City Park, Faribault County, Minnesota. Spring 1979.

Field Supervisor: Site Survey of the Proposed Wastewater Treatment Facility in Zumbro Falls, Wabasha County, Minnesota. Spring 1979.

Field Supervisor: Site Survey of the Stanton and Preferred Corridors, North and South Dakota. Summer/Fall 1978.

Principal Investigator: Site Survey of the Bureau of Reclamation Irrigation Project Near Pollock and Herreid, Campbell County, South Dakota. Summer 1978.

Field Supervisor: Site Survey at Garvin Park, Lyons County, Minnesota. Fall 1977.

Principal Investigator: Excavation of the Eleanor Site (21NL30), Nicollet County, Minnesota. Summer 1977.

Principal Investigator: Archaeological Site Survey of the Eleanor Site (21NL30), Nicollet County, Minnesota. Spring 1977.

Principal Investigator: Archaeological Survey of Woods Lake Park, Faribault County, Minnesota. Fall 1976.

Principal Investigator: Site Survey of Swan Lake Perimeter, Nicollet County, Minnesota. Fall 1976.

Field Supervisor: Archaeological Excavation of the Eleanor Site (21NL30), Nicollet County, Minnesota. Summer 1976.

Principal Investigator: Aerial Site Survey of Lake Ashtabula, Barnes County, North Dakota. Summer 1976.

Salvage Excavation of the Silvernale Site, Goodhue County, Minnesota. Spring/Fall 1976.

Field Supervisor: Site Survey of the Swan Lake Perimeter, Nicollet County, Minnesota. Fall 1975.

Field Supervisor: Site Survey of the Rochester Flood Control Area, Olmsted County, Minnesota. Fall 1975.

Crew Member: Excavation of the Mankato Site, Blue Earth County, Minnesota. Summer 1974.

Crew Member: Excavation of the Bauer Site, LeSueur County, Minnesota. Summer/Fall 1972.

PUBLICATIONS AND MANUSCRIPTS

The Archaeological Survey of Stoney Point Park, Lincoln County, Minnesota. Winter 1980/1981.

An Archaeological Reconnaissance Survey of the Cannon River Park, LeSueur County, Minnesota. Winter 1980/1981.

Intensive Archaeological Reconnaissance and Site Testing for the National Register of Historic Places, Harlan County, Nebraska. Volumes I-II. With Richard A. Strachan, Patricia M. Emerson and Wanda A. Watson. February 1981.

Cultural Resource Survey of the Kasota Access, LeSueur County, Minnesota. Summer 1980.

Archaeological Reconnaissance Survey of the Louisa Transmission Circuits 345-56-93-H-1 and 345-93-H-T-1 and Substations T and 92, Muscatine, Louisa and Washington Counties, Iowa. Summer 1980.

The Cultural Resources Survey of the Henderson Station County Park, LeSueur County, Minnesota. Summer 1980.

The Cultural Resource Survey of the Proposed Underground Transmission Lines, Lac Qui Parle, Yellow Medicine and Chippewa Counties, Minnesota. Summer 1980.

The Cultural Resource Survey of the Proposed Channel Realignment Area at Big Stone-Whetstone Flood Control Project, Big Stone and Lac Qui Parle Counties, Minnesota. Summer 1980.

The Cultural Resource Survey of McDonald's Park near Hutchinson, McLeod County, Minnesota. Summer 1980.

An Archaeological, Architectural-Historical and Geomorphological Survey at Maquoketa Caves State Park, Jackson County, Iowa. Volumes I-III. With Richard A. Strachan, Michael A. Eigen, Robert Douglas and Patricia M. Emerson. July 1980.

The Cultural Resources Survey of the Depot Riverside Park in Kenyon, Goodhue County, Minnesota. Spring 1980.

The Cultural Resources Survey of the Proposed Wildwood County Park, Blue Earth County, Minnesota. Spring 1980.

The Cultural Resources Survey of the New Ulm Airport Expansion Project, Brown County, Minnesota. Winter 1979.

The Cultural Resource Investigation of the Wild Rice River - South Branch and Felton Ditch Flood Control Project Area, Clay and Norman Counties, Minnesota. With Michael A. Eigen. Winter 1979/1980.

An Archaeological Investigation of the Proposed Lagoon Site, Dam Site Recreation Area, Coralville Lake, Iowa. With Richard A. Strachan. Winter 1979.

The Archaeological Reconnaissance Survey of the Storm Water Diversion and Treatment System Project, Waseca County, Minnesota. Summer 1979.

An Archaeological and Historical Survey and Report of Findings on Proposed Bureau of Reclamation Project near Pollock and Herreid, South Dakota. With Nancy L. Woolworth. Summer 1978.

Cultural Resource Inventory of the Historic and Prehistoric Resources of the Chippewa National Forest. With Nancy L. Woolworth. Summer 1978.

Aerial Infrared Archaeological Survey of Lake Ashtabula, North Dakota. With Richard A. Strachan. Fall 1976.

Archaeological Survey of the Mankato Flood Control Area. With Richard A. Strachan. Fall 1975.

TEACHING EXPERIENCE

Adjunct Faculty (Sessional): Department of Sociology, Mankato State University, Winter 1980.

Adjunct Faculty (Sessional): Department of Sociology, Mankato State University, Winter and Spring, 1978.

Adjunct Faculty (Sessional): Department of
Sociology/Anthropology, Hamline University, Summer 1977.

Adjunct Faculty (Sessional): Department of Sociology,
Mankato State University, Spring 1977.

Adjunct Faculty (Sessional): Department of Sociology,
Mankato State University, Winter 1976.

Teaching Assistant: Department of Anthropology, Ohio State
University, Winter 1974.

Teaching Assistant: Department of Anthropology, Ohio State
University, Spring 1974.

AREAS OF INTEREST

Eastern North American Prehistory, Upper Great Lakes
Prehistory, Paleoecology, Conservation Archaeology, Physical
Anthropology, Museology.

PROFESSIONAL MEMBERSHIPS

Society for American Archaeology
Council for Minnesota Archaeology
Blue Earth County Historical Society

REFERENCES

Christy A. H. Caine
State Archaeologist's Office
c/o Dept. of Anthropology
Hamline University
St. Paul, Minnesota 55104

Richard A. Strachan
Professor of Anthropology
Dept. of Sociology/Anthropology
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Mankato, Minnesota 56001

Paul F. Brown
Associate Professor of Anthropology
Dept. of Sociology/Anthropology
Mankato State University
Mankato, Minnesota 56001

APPENDIX E: PLATES



PLATE # 1: EROSION STATION # 6 (21 OT 91) LOOKING FROM EAST



PLATE # 2: CUTBANK AT EROSION STATION # 8 (21 OT 92)



PLATE # 3: MASSIVE BANK
FAILURE AT EROSION STATION
8 A (21 OT 93)



PLATE # 3: CUTBANK AT EROSION STATION # 5



PLATE # 5: 21 OT 82 WEST SIDE OF BURIAL MOUNDS FROM SOUTH SHORE



PLATE # 6: 21 OT 82 MIDSECTION OF MOUND GROUP TAKEN FROM SOUTH SHORE

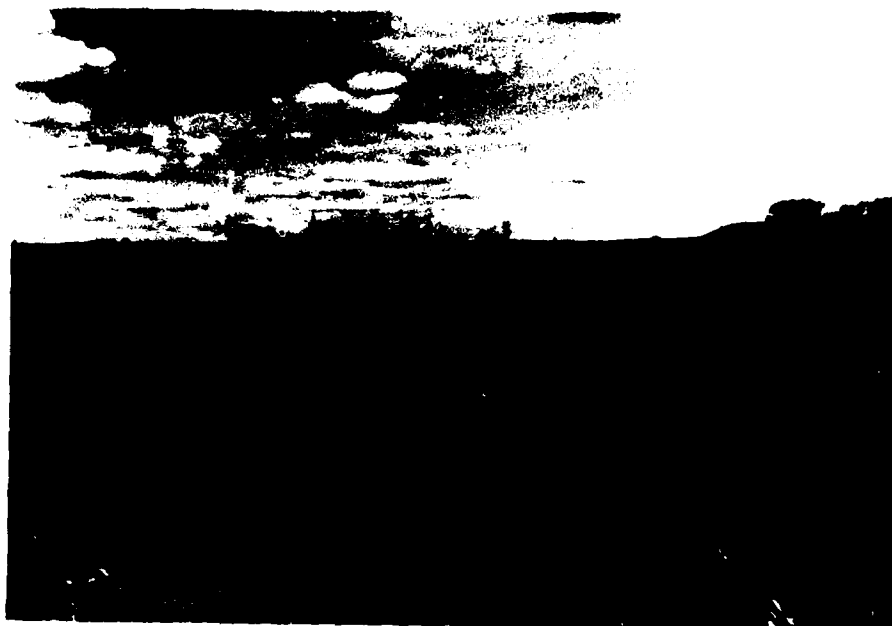


PLATE # 7: 21 OT 82 VIEW OF DATUM MOUND (IN TALL GRASS)



PLATE # 8: SHOVEL TESTING AT EROSION STATION 8 A (21 OT 93)

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